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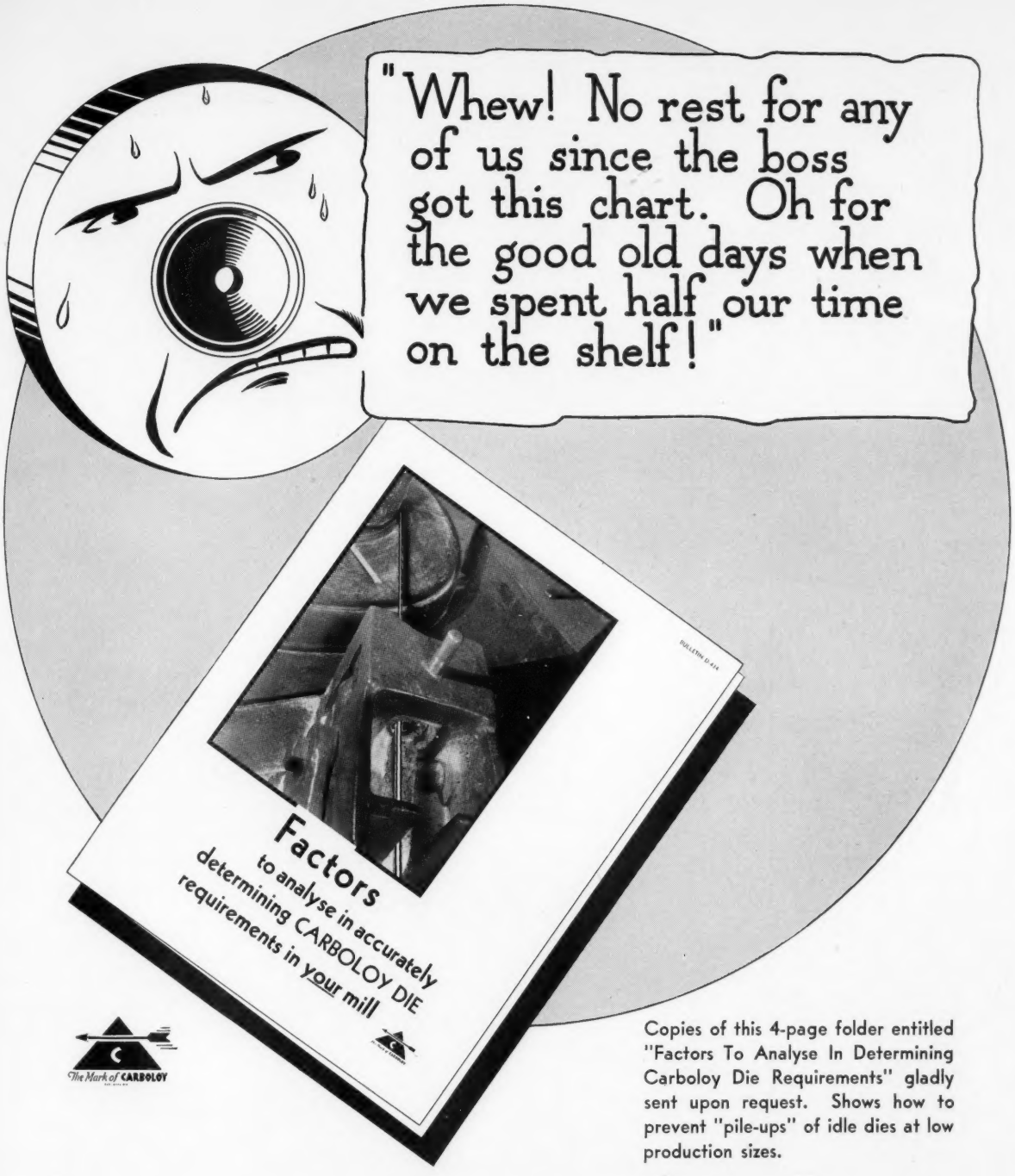
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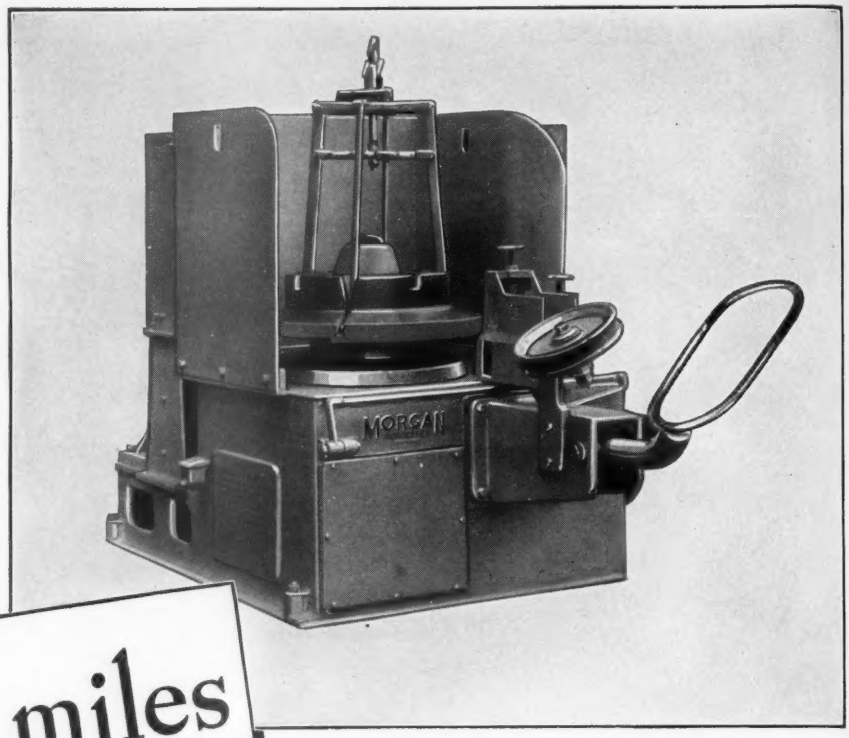

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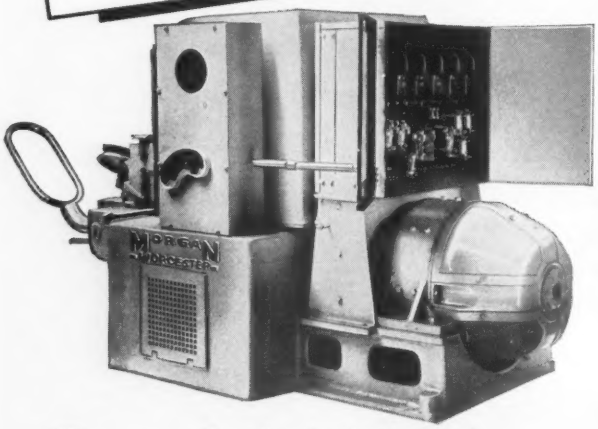

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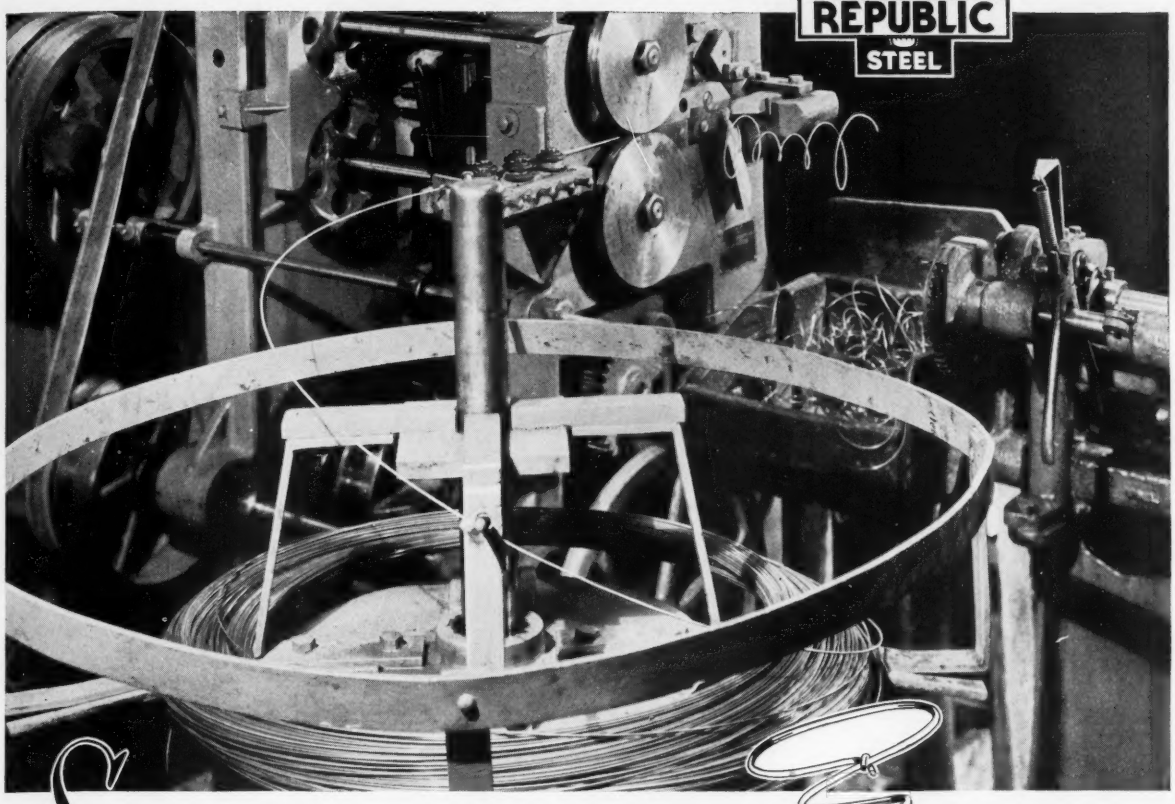

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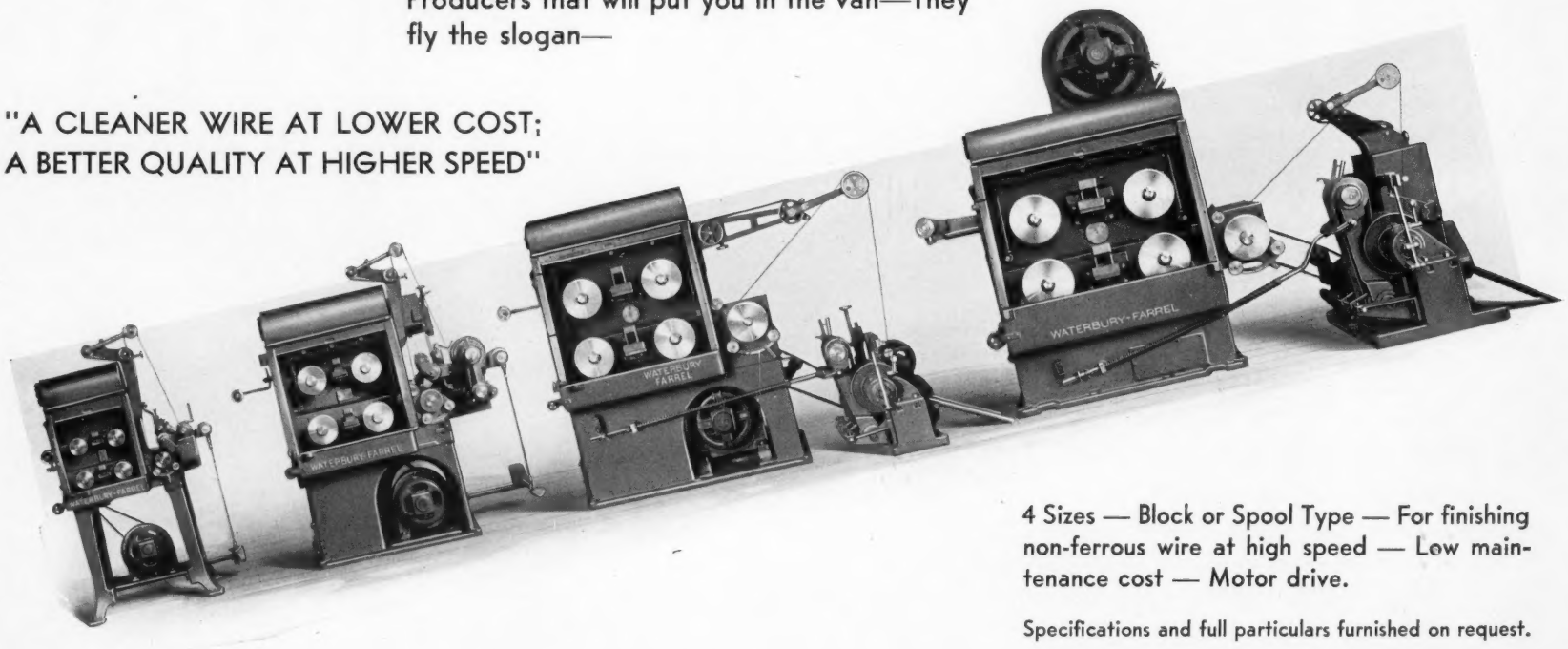

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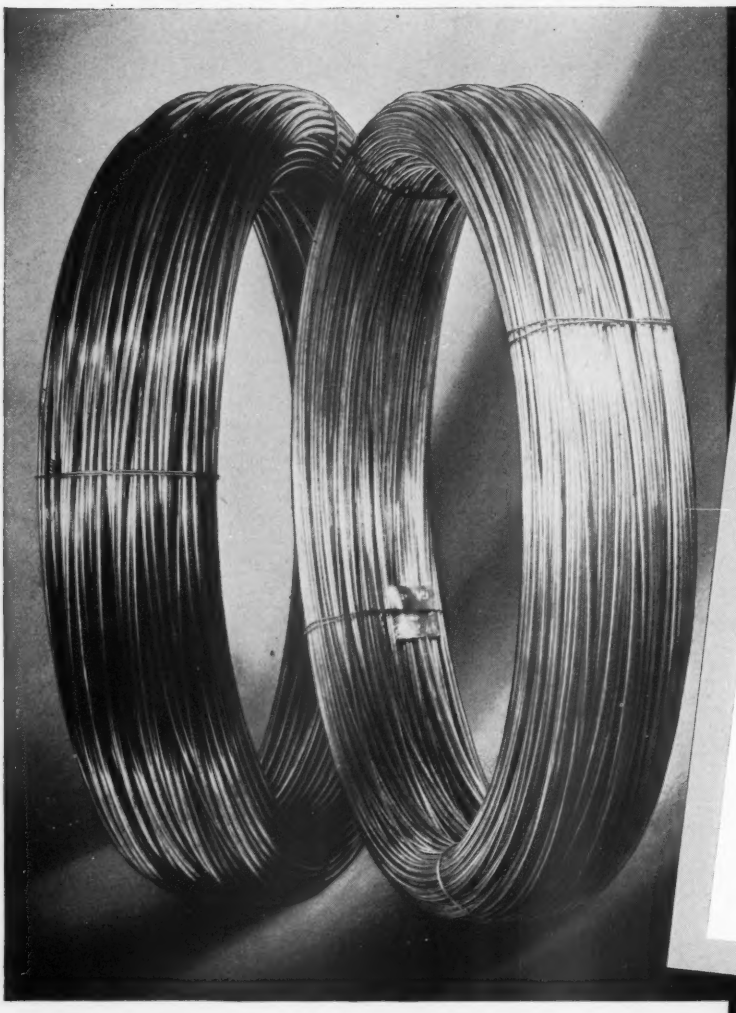

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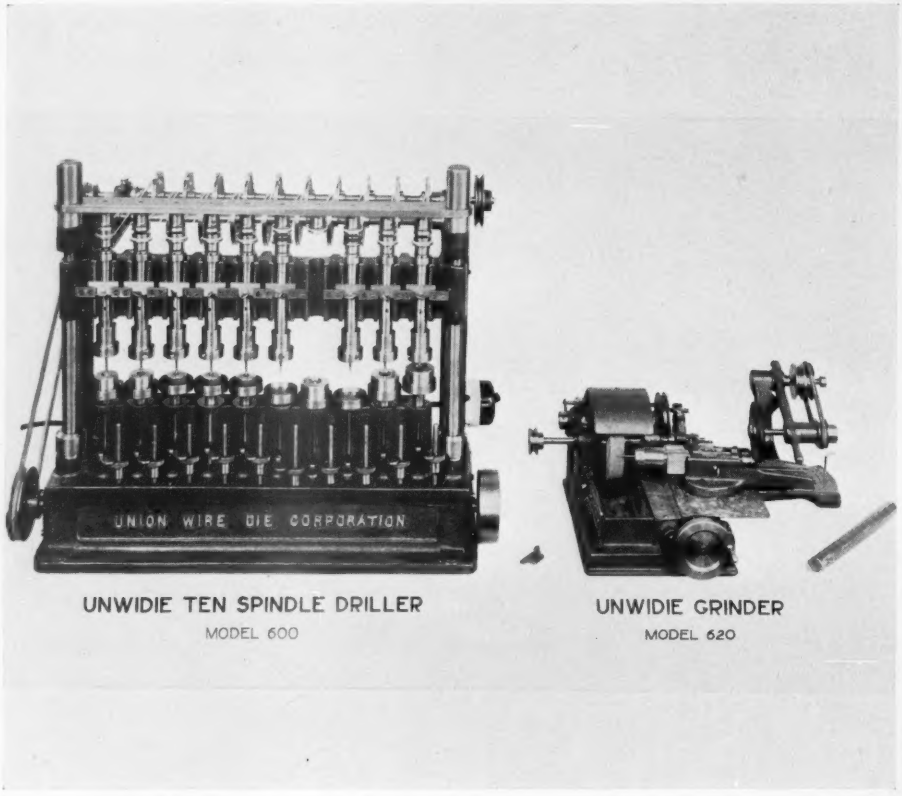

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip
Wire Products and Insulated Wire and Cable
DRAWING—ROLLING—EXTRUDING—FORMING—FABRICATING

Vol. II March 1936 No. 3

Designated as
Official Publication By The Wire Association

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Publication Office: Washington, N. J.
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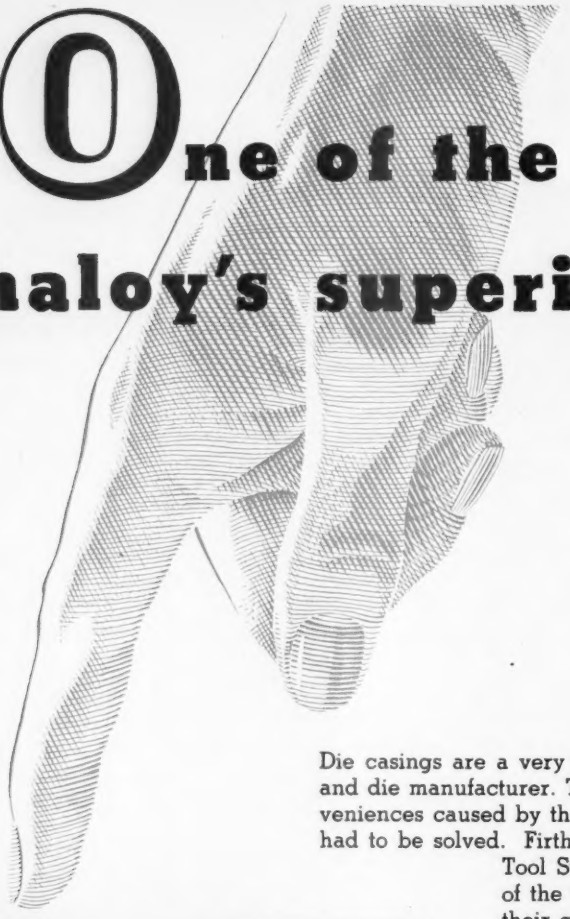

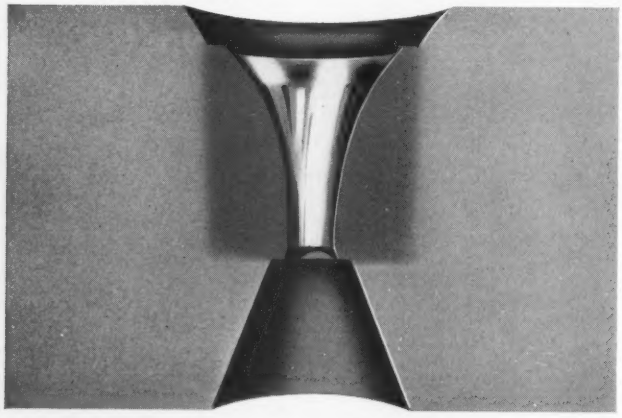

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A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING --- ROLLING--- EXTRUDING --- FORMING --- FABRICATING

Vol. II | MARCH 1936 | No. 3

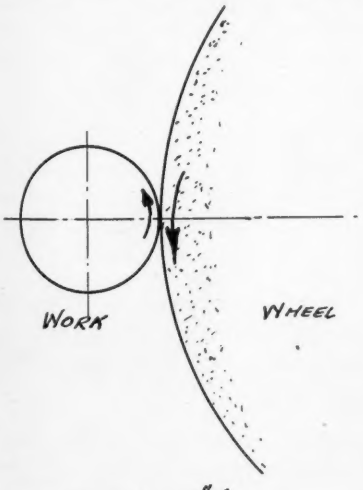
Roll Grinding

By J. R. Leonard,

Engineer Machine Division, Norton Company,
Worcester, Mass.

Because of the high quality of finish now required by buyers, the roll grinder is faced with materially new problems. A discussion of these problems, together with practical operating suggestions is given here.

MANUFACTURERS and users of rolled metal today are demanding a quality of finish which has placed a very definite responsibility on the roll maker and consequently the grinding machine builder. Finishes which once were considered elegant are no longer acceptable. Where once a reflective surface was not desired, today the roll surface must shine like a mirror. In addition, the roll must be accurately round and straight. Any slight inaccuracy will cause inaccuracies in the thickness of the rolled product, and likewise any imperfections in the roll surface are reproduced in the surface of the product.



SKETCH #1

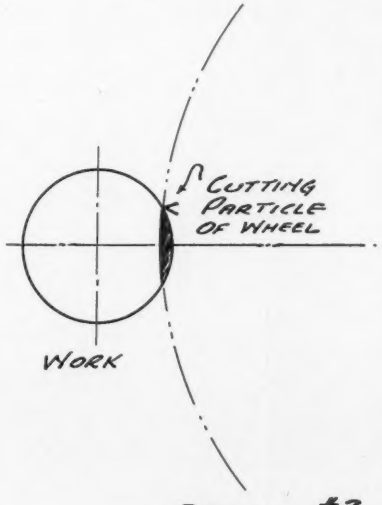
✦ ✦ ✦

The Grinding Process

IT may be advisable at this point to describe briefly, and perhaps in a somewhat elementary fashion, the grinding process as a basis for what is to follow. The roll is revolved, either on centers or its own journals, in one direction and traversed back and forth simultaneously through a distance equal to the length of roll surface being ground. The grinding wheel revolves in the same direction but since the opposite sides of the wheel and work are in contact, their relative directions of travel are in opposite directions.

✦ ✦ ✦

NOW a grinding wheel is made up of millions of fine cutting particles held together by a bonding material such vitrified clay, rubber, bakelite or shellac. Each of these particles when it contacts the surface of the roll cuts out a tiny chip the shape of which will depend on the size of the particle (the grain of the wheel), the diameter of the roll, diameter of the wheel and the relative speeds of the wheel and work. Some idea of the shape of this chip can be obtained by considering the work as standing still and the wheel made up of a single cutting particle. The groove made in the work then is shallower at its ends and deeper



SKETCH #2

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at its center. Furthermore, due to the relative positions of the wheel and work, these grooves or valleys are approximately parallel to each other and at right angles to the length of the roll. A highly magnified spot on the surface of the roll would look like this where the shaded areas represent the grooves or valleys. Shifting our imagination back to a grinding wheel with its many, many cutting edges it is not difficult to visualize a surface made up of thousands and thousands of hills and valleys paralleling each other around the roll surface and conforming to a consistent pattern.

✦ ✦ ✦

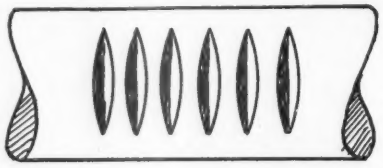
Problems of Roll Grinding

THE reductions of these hills and the elimination of the valleys is the problem confronting the roll grinder today. Where highly reflective finishes are required, it is necessary to "build up" the surface with a series of wheels starting with a relatively coarse grit size and working finer with each succeeding wheel. For example, on hardened steel rolls one might start with a 3846-L5B Alundum vitrified for the initial roughing. Then use a 38100-16B Alundum vitrified which is finer, softer and of slightly more open structure. For the final finishing operation a 37500-19L Crystolon Shellac is typical. This is a very fine polishing wheel and practically no measurable amount of stock can be removed. Such recommendations can only be classed as general selections inasmuch as the diameter and length of roll, type of grinding machine used and the user's requirements on quality of finish would necessarily change such specifications accordingly. For rolls of other alloys, wheel selection would correspondingly vary.

✦ ✦ ✦

The Lubricant

THE correct coolant or lubricant plays an important part in the finishing of roll surfaces. There are two general types of lubricants on the market for this work; one being of the emulsified oil variety and the other a soda compound. Emulsified oil coolants probably are better lubricators but they are "heavier" being of the approximate consistency (and resembling in appearance) of ordinary milk. Some of them basically are made of animal fats and as a consequence become rancid after some use. Furthermore, the fatty material



SKETCH #3

tends to separate from the solution and congeal between the grains in the wheel face. Small particles of metal and abrasive become imbedded in this sticky substance later to be released and pass between the wheel face and the roll, producing objectionable scratches.

✦ ✦ ✦

SODA water solutions are thinner and have less surface tension, thereby permitting grinding chips and abrasive particles to settle out easier. It is doubtful if they have the same lubricating properties nor are they generally considered as rust resistant. Some of them also are iritating to the skin and may attack the machine finish, causing the paint or lacquer to skin off. On the whole, however, they are considered superior as roll grinding coolants.

✦ ✦ ✦

FILTERS are being used more today for this class of work. Some are comparatively simple and have been improvised by the operator from a few thicknesses of cloth tied over the water nozzle. Others are more elaborate, one type consisting of two sets of very thin metal fins mounted on separate spindles, the fins of one set passing between those of the other set. Another type consists of a metal container filled with a wastlike filtering substance. Its particular feature is that the flow of coolant through it can be reversed as an aid to cleaning.

✦ ✦ ✦

Roll Grinding Machines

THUS far nothing has been said of the machines used for roll grinding. Grinding machines are rated as the swing over the table by the distance between centers. There are a number of makes on the market ranging in size from 6″ x 18″ up to 36″ x 192″. The size to use depends, naturally, on the size rolls to be ground. Tinning mill rolls which are relatively small in diameter can be ground in a 10″ or a 14″ machine of sufficient length to accommodate the longest roll one expects to grind. Hot mill rolls are large in diameter and heavy, therefore, requiring a larger machine.

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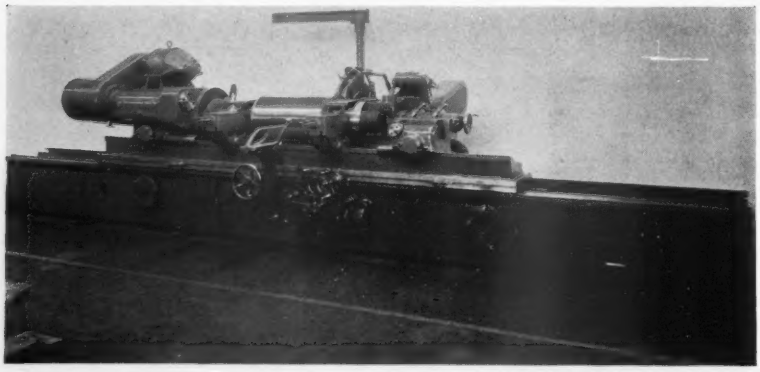
MEN with long experience in the art of roll grinding—and it is an art often requiring the patience of a Di Vinci to obtain the results desired—agree that a roll grinding machine must possess certain definite characteristics, whether it be hydraulically or mechanically operated is of no particular importance as equally good results can be obtained with either type. The selection of one type or the other is

(*Please turn to page 149*)



A Typical Roll Grinding Machine Which Will Accommodate Rolls 24″ in Diameter by 120″ Long.

Inhibitors

By Kenneth B. Lewis
Consulting Wire Mill Engineer, Worcester, Mass.

A discussion of inhibitors and their application, together with an outline of certain experiments and setting forth the conclusions derived therefrom. ✦

UNLIKE most of the fundamental changes in wire practise, the use of inhibitors has come in within the active life of most present mill executives. It is quite distinctly a development of our generation. It may seem a bit extravagant to refer to it as fundamental, but the use of inhibtors was the first and vital step in a series of moves which made the cleaning house habitable and opened the road to that study and control of the important operations of cleaning, coating, and baking which I believe we shall some day look back on as of great importance.

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THE problems and perplexities of inhibiting are many. I do not hope to greatly illuminate them, except to the degree that any problem is illuminated by the initiation and encouragement of discussion, but having been interested in the subject from the beginning, and having talked it over with inhibitor manufacturers and salesmen, cleaning house foremen, superintendents and purchasing agents, I should be able at least to interpret to each party the perplexities of the other.

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Action Of Acid

WE may as well admit at once that the name "inhibitor" is a poor one. It implies a complete prevention of acid attack, and while some compounds do just this they are rather poor for wire mill use. Restrainer would be a better word, but it is too late now. Speaking in general terms, iron scale does not dissolve in acid. It cracks readily, acid creeps under the scale, attacks the metal, generates hydrogen, and the bubbles of hydrogen push off the scale. If this action was uniform we should need no inhibitor—we should have a small but constant and unavoidable loss of steel and consumption of acid. Such is not the case. The scale sticks in spots, and while we await the slow penetration of acid to clear these spots the steel already laid bare is bubbling merrily, giving up its substance and killing good acid. What we need is a situation in which after the steel has yielded to attack just long enough to generate sufficient hydrogen to push off the scale it will become locally resistant to further attack.

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Effect of Inhibitors

THIS is just what an inhibitor does to acid, or to steel, or both. As to the mechanism by which the result is reached, we are as yet in the dark. Let the scientists fight it out. What we want is, first, a lively evolution of hydrogen, a cracking off of scale, and then a quick dying down of the attack so that while the tough bits are still sticking, the bare steel will be as nearly inert as possible; and a dozen or more inhibitors are approximating this ideal.

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Their Gradual Improvement

IT has been known for many years that certain substances had this effect in the pickling bath. Practically all of them were nitrogenous, and since early researches seemed to show that their efficiency rose directly with the concentration of nitrogen, especially in the form of protein, it was often assumed that inhibition was linked to the familiar passivating of steel by strong nitric acid, and that that inhibitor was most efficient which yielded the greatest number of units of nitrogen per dollar. This theory was long ago knocked out, first by the discovery that certain organic substances entirely free from nitrogen were excellent inhibitors, and finally by the discovery of inhibiting effects in completely inorganic salts. Organic substances still make up the bulk of the inhibiting material in common use. The early inhibitors, however, were natural substances or wastes of chemical processes, and contained vast quantities of inert material which not only raised freight charges but tended to make sludge and scum, stick to the wire, and often raise the devil with coating and drawing. Patiently and step by step the vital ingredients were determined, and segregated. Today the inhibitor may often constitute less than one hundredth of one percent of the bulk of the cleaning bath.

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The User Has a Duty

WE owe much to the inhibitor manufacturers. They have cut our acid consumption by about forty percent. Much of this saving is of course to be credited to automatic steam control, acid testing, permanent acid tubs, and a general tightening up of cleaning house control, but this in itself is largely a consequence of their use. One way in which we could show our appreciation, at the same time cut their sales expense and serve our own interests, is to develop some rational way to evaluate their product, or at the very least to develop rational habits of thought regarding it.

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THIS will not be easy. In the first place inhibitors have many functions other than saving acid. They have other effects, for

better and for worse. Due to local conditions and unusual requirements, any one of these subsidiary effects may prove to be a compelling reason for or against the use of an inhibitor. A few instances may well be cited.

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Subsiding Effects

THE passivating effect of an inhibitor may be so strongly in evidence that the rod picks up practically no discoloration between the rinse and the lime. If in addition the inhibitor is a completely soluble inorganic salt, leaving no residue and offering no obstacle to the formation of a thin and very uniform lime coat, the set-up may be so attractive as a basis for an extra bright finish that every other factor may be discounted. On the other hand I have known such an inhibitor to be thrown out on the ground that it took so long to break down the passivation and put on a heavy sull coat that the sull rack was over-crowded.

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FOR some purposes a distinctly etched surface is desired. It has been stated that wire which has once been strongly passivated will not take spelter quite satisfactorily, even though the cleaning just prior to fluxing be done in straight acid. The point has been disputed, and is very obscure, but certain otherwise first-rate inhibitors have been condemned on this ground alone.

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ALTHOUGH most modern cleaning houses are now well ventilated, and over-steaming has been largely prevented by automatic control, there remains some demand for a definite blanketing. Sulphuric acid is liquid at all temperatures and should not get into the air, but as hydrogen bubbles reach the surface of the bath they break and kick into the air a little spray which is picked up and floated by the water vapor curling off the bath. Acid is thus mechanically carried in this vapor. Where ventilation is poor there is a field for the foam blanket and for the inhibitor which either carries a blanketing substance or will readily co-act with one. Some of these blankets have the unfortunate property of clinging to the wire in spite of all efforts to rinse them free.

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A PROPERTY highly valued in some plants is that of holding down the rate of attack even after a long immersion. Some inhibitors act quickly and satisfactorily for the normal cleaning period but fail to "carry through" and if a crane breaks down it becomes necessary to over-dose the bath with inhibitor to prevent pitting and heavy metal loss. The over-dose affects subsequent operations adversely. Mills so unfortunate as to have unreliable cranes may pick an inhibitor chiefly for its ability to continue inhibiting indefinitely. A similar though not necessarily related property of some inhibitors is the ability to stand repeated heating and cooling of the bath, and week-end shut-downs. This is of course characteristic of inorganic substances, which persist in the bath indefinitely.

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INHIBITORS vary in the mode of application to the bath. Some are dissolved in the strong acid, and so are added automatically and without labor or supervision. Some require to be weighed or measured into the bath not only at the original make-up but at each subsequent addition of acid. Others are "one-shot" reagents, seeming to need no replenishing. They may be said to inhibit the bath, rather than the acid. The particular labor set-up in the cleaning house may favor one or the other type on these grounds. Powders have the advantage over liquids that their containers are unbreakable and non-returnable, and, other things being equal, this small point may carry a good deal of weight.

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CERTAIN inhibiting substances increase the solubility of iron salts, and make it possible to run to a high Beaumé before dumping. Whether or not advantage can be taken of this property is a local question, as will be brought out later. If so, the advantage will appear in the consumption figures.

Difficulties of Trials

WHILE any of the properties described may prove a compelling reason for the adoption or rejection of an inhibitor, the fact remains that inhibitors exist chiefly to save acid, and are sold on that basis. Comparative tests, however, are by no means as simple and conclusive as one would think. There are not many mills running steadily on common products in uniform proportion and of fixed composition. The average mill is dealing with a great variety of raw materials, and every variety reacts differently to acid. Coarse rods have a different scale from standard rods. Annealed wire differs from both, and successive lots of annealed wire differ from each other. Patented stock is in a class by itself. Carbon, phosphorus, silicon, and in a lesser degree other normal elements of steel affect its speed of solution, singly, and in combination. Normal rods differ in the amount of scale, and the way it clings to the base metal. They differ from day to day, and through gradual alteration in furnace ports, walls, etc., they may differ from month to month. Certain heats of steel, certain rollings of rod, as is well known, are mysteriously afflicted with a very mean scale.

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EXPOSURE of wire rod to the weather has varying effects. By and large, three weeks in the weather will cut the acid consumption. Further exposure increases it, and every wire man has had the tough experience of working up old pitted rods from the bottom of the pile. Double cleaning must sometimes be resorted to, and limed rods sent back for re-cleaning eat up plenty of acid.

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IN many mills where a good deal of annealed or repatented wire is cleaned it is common practise to work on such stock while the acid is sharp and the iron low, and then to run down the tub on rods. When all the rods required by the drawing schedule are in the baker the tub must be dumped so as to get a fresh bath for the process wire and if the tub capacity and working schedule are such that the bath is

dumped low in iron, an inhibitor on test is just out of luck. So also is it out of luck if a crane breaks down, or a tub boils over, or if a couple of car-loads of rusty rods suddenly appear from the far end of the storage yard.

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The Personal Factor

ALL in all, it is unfair in most cases to base figures on anything less than a month's run, and even in a month's run there may be plenty of upsets. It goes without saying that the foreman is a big factor in such a trial. He is the big X in the demonstrator's equation, and who can blame the demonstrator for wondering whether X can be squared? For that matter the foreman is entitled to sympathy. Being human, and usually very busy, he hates the turmoil and interference incident to an inhibitor trial. He has just gotten used to one good inhibitor; perhaps he still recalls fondly the memory of the genial and free-handed demonstrator with whom he learned to use it. He resents the suggestions of the young squirt who is trying to break up this friend's business. Being human, is he to be blamed if his hand is a little heavy on the steam valve, and if he plays it very safe on Beaumé? And yet there may steal into his subconscious mind just the shadow of a thought; might it not be possible to build up this young squirt into a genial and free-handed, etc., etc? Over the further implications of this line of thought let us draw the veil of charity.

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What to Look For

HOWEVER burdensome and hazardous an inhibitor trial may be, there is no excuse for our fumbling the result. Having listened to much casual comment on the subject I am surprised at the great weight attached to the first cost of inhibiting acid. I don't mean necessarily the price per pound of the inhibitor itself, for it is generally known that some of them lend themselves to extreme concentration and easily rate a high unit price. Prices range from five cents to a dollar and a quarter a pound without exciting much comment. But the cost of inhibiting a given unit of acid, or acid for a given unit of steel, while a figure of definite significance in the equation, should not be considered until the acid consumption figures are in. It will range from two to six cents per ton of rod cleaned. As between two first class inhibitors a difference of ten percent in pounds of acid per ton will not be at all unusual. This would amount to possibly five pounds.

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IT is true that five pounds of sulphuric acid delivered into the tub may cost no more than three cents, but it is equally true that every pound of acid destroys half a pound of steel. This steel, in the shape of wire rod, is never worth less than two cents a pound. As high carbon rod, it is worth more; if patented, still more, and if annealed or repatented its cost is inflated with much processing labor. It is very safe to conclude that a difference of five pounds acid consumption means ten cents per ton of wire cleaned, a difference which would wipe out several times the spread between the cheapest and the costliest inhibitor. It is to be noted that the possible absorption of part of the acid by scale cuts no figure in this calculation; we are dealing only with a difference, and the difference is properly chargeable with loss of metal in exact proportion to the molecular weights of acid and iron.

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Accelerated Service Test

IT is fashionable for an operating man to be a little contemptuous of laboratory tests. I've been on both sides myself, and there is much to be said for both viewpoints. In fact most of it has been said. Nevertheless an operating man and a chemist can put their heads together and run off in a few hours an inhibitor test under conditions that simulate very closely those of the cleaning house. Such a test is of especial value where an inhibitor is known to have one or more subsidiary advantages of considerable appeal and it is desired to find out whether it is within acceptable limits on acid consumption. Make up duplicate glass beakers of acid of the usual pickling strength, inhibited with the prescribed amounts of the two inhibitors. This is a comparative test only; it does not give a positive acid figure, but it tells definitely by what percentage the inhibitor under test is better or worse than that for which the mill presumably has figures already.

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SET the two beakers in a water-bath heated to the usual working temperature; the water-bath will keep them at the same temperature. Cut a number of pieces of rod or wire, long enough so that immersion in the beaker bath will pickle less than half the length. Put about five of these into bath A, and when they are clean reverse them and clean the other ends in bath B. This gives both baths an even break. There is no steam jet to dilute the baths, so there will be some evaporation, and care should be taken to keep both at the same level, so the same amount of rod surface will be pickled in each. Mark the starting level and add water as needed from time to time to keep the baths up to the marks. After a rinse in tap water a light rub with the tips of the fingers will be about as effective as a pressure hose to clear off clinging scale, and if the operator is a square shooter and gives both baths an even break in this matter he will get real information.

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IF desired the load can be varied, basic rod, patented rod, patented or annealed wire, etc., in the proportions likely to be met in actual operation. Keep a rough check on the time cycle. When one or both baths tend to slow up, add exactly the same amount of acid to each, and inhibitor in the proportions specified, if any, and go on pickling. Run up the Beaumé to about the usual dumping point, then, being sure that both baths are up to the proper level, run acidity and iron determinations. Both baths have done exactly the same work in exactly the same way, and have received exactly the same amount of acid. If one runs a higher residual acid-

(*Please turn to page 155*)

Wire Ropes And Stresses

By Richard Saxton
Sheffield, England

A discussion of the effect of strain or tension occuring during the use of wire rope together with formulas for computing such stresses. ✦ ✦

STRESSES to which wire ropes are subjected during service are various, the principal being tension generated by raising of static load; kinetic, (stress due to acceleration during raising or lowering of load); and tension produced by bending over pulley or drum. Though these can all be determined there are others non-calculable such as wear and fatigue of rope metal due to severe service conditions, and it is a tribute to the quality material employed in fabrication that few ropes fail to fulfill the high standards specified.

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BROADLY, almost all ropes may be described as haulage, i. e. their primary purpose is to assist in the removal of loads. Practically the only class not coming within this category is the rope guides as employed in mine shafts, but though these in service are a fixture or stationary they are subject to stresses equally as detrimental as those imparted to the traveling type; therefore a description of service defects particular to this class will be included.

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WIRE rope construction may be divided roughly into three groups, (1) Simple cylindrical strand construction (six strands round fibre core) (2) Multiple construction of concentric layers of round strand, and locked coil. Although superseded by the half or full-lock rope in many deep pits or where high speed is essential, the strand still has the widest general application. Various other constructions are fabricated such as flattened strand, etc., but as these are employed principally for special purposes or where conditions do not permit of the installation of the strand type, their stresses and incidental defects will not be included in this article.

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TAKING first the simple strand construction, as the rope having widest application stresses generated during normal service conditions are first considered. When strain or tension is applied as in the hoisting or drawing of a load the wires composing a strand move relatively to each other, greatest relative movement taking place between outer wires and strand core, the strand elongating in part by the extension of the wires and partly by the straightening of the helix. The repeated elongation and straightening exerts a wearing effect on the main core, result, when pronounced, leading to wires in adjacent strands rubbing against each other with resultant heavy wear, whilst failing cushioning effect of main core causes wires to pull and straighten out; a condition of permanent stress quickly leading to fracture.

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WHERE exposed to severe crushing stress such as when travelling on drums with over-riding turns ropes are usually fabricated with strand main cores, constructed of milder material than employed in the fabrication of the outer strands. The employment of a milder metal as the main core unit permits of greater stretch under load and also furnishes a more solid, yet flexible, cushion than possible with the fibre type, whilst resistance to corrosion trouble is more pronounced. Though fairly flexible, objection to the more general use of this construction is difficulty in splicing when necessary.

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ONE of the most serious unavoidable stresses leading to deterioration is the longitudinal vibratory stresses set up by the vibrations of the rope during tension. These are imparted by various factors; tension generated by raising of load; with rope guides the passing of the cage; and in aerial ropes sway produced by travel of load. Research work has proved that greatest detrimental effect is at the point nearest load, and is due to intensification of stress by check on oscillations at this point.

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AS a preventitive of the exceptional stresses generated, and to increase elasticity of rope line, the use of shock absorbers has been recommended, and various types of this unit are now in service. Though majority tried have had as their foundation a series of rubber rings set between iron cups, the efficiency of spiral springs in a suitable container has not been overlooked, and where set so that natural period of vibration does not conflict with that of the rope, these have given satisfaction.

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PARTICULARLY severe in its action on ropes of the strand type, vibratory stress is engendered in all ropes immediately tension is applied, and though many methods have been introduced to minimize none have been successful in eliminating. Best practice with ropes in regular service is to cut off a length of from 3 to 6 feet at point nearest load. By employing this method chief danger point is eliminated for a period and other parts subjected to stress given a change of position, thus minimizing stress on particular parts previously subjected.

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BENDING stress when rope travels over pulley or drum (a combination of compression and

tension forces), have a detrimental effect on rope life and fractures of wires or strands are probably more frequently due to this than the vibratory stresses previously mentioned. Maximum durability and tenacity are only attained by employing outer wires of as large a diameter possible consistent with size of diameter of drum or pulley, and larger the surface wires lesser the wear, due to greater contact area presented by each individual wire.

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UNSUITABLE pulleys are a frequent source of detrimental compressive stress and shorten the life of numerous ropes which, otherwise, would give economic service. Below are given 4 different dia. ropes, (strand), and absolute minimum dia. of pulley suitable. While ropes and pulley dia.'s specified will give good service, larger pulleys ensure longer life and higher efficiency generally.

Rope Circ.	Diameter	Pulley Dia.
1″	5/16″— 8M/m	4.5″
2″	5/8″ —16M/m	10.0″
3″	15/16″—24M/m	1′ 9″
4″	1¼″—32M/m	3′ 3″

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LOCKED coil ropes with their greater metal mass in given area and resultant proportional lack of flexibility necessitate the employment of much larger pulleys, and minimum pulley dia. for ropes of this class with 2, 3, and 4 inch circumference are 6, 9, and 12 feet respectively.

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THOUGH many formulas or equations exist for computing bending stress as generated in passing over pulley or drum, it is a subject on which many recognized authorities differ, and while to attempt to give even a brief outline of the various theories advanced would take up space not available within the scope of this article, the following is furnished as one of the simplest equations originated by that eminent authority, Reuleaux.

$$f = K.E.\frac{d}{D}$$

f = stress in fibres of material farthest from neutral axis of wire (bending), and from centre of wire (torsion).

E = modulus of elasticity for the material.

d = Diameter of individual wire.

D = Diameter of pulley round which rope is bent.

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IN studying the above formula it should not be overlooked that we are dealing with a complicated bent beam or helical spring with a compound double helicoid, and that the unit wires during compression accommodate themselves by sliding upon their neighbors both longitudinally and axially, the bending of the rope during travel of pulley being composed of combined bending and torsion of the units.

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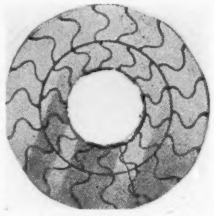

Two Layer Tubular Aerial Stranding Rope. ✦

A SIMPLE expression is therefore employed, governed by a suitable factor which has been found by practice to avoid a more complicated equation. This factor ranges from .3 to .6; many authorities asserting .4 to be best for ropes of medium flexibility. To find force equivalent to bend stress over pulley or drum it is therefore necessary to compute bend stress for each size of wire and area of each when

$$\text{Load equivalent to bending stress} = \sum (\text{area} \times \text{stress}).$$

(Formula by courtesy of Wrights' Ropes Ltd. Birmingham).

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AGGREGATE stress should never exceed 50% of specified breaking strain, for at this figure limit of proportionality is reached. Where kept below rope is perfectly elastic and safe, but if exceeded permanent stretch is imparted and elasticity destroyed, a condition undetected by surface examination but which renders raising of the lightest load a dangerous operation.

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TURNING to guide ropes which differ from other types in that they are a fixture or stationary during service, the two most severe defects to which they are subject are corrosion (internal), and vibratory stress. Under constant tension, (essential for smooth running), this is varied in the different ropes thus ensuring that periods of oscillations vary, which eliminates possibility of simultaneous or excessive sway due to synchronous vibrations.

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DUE to their stationary position and exposure to moisture guide ropes are subject to severe internal corrosion, a form of wear difficult to detect. To minimize and ease the position of the rope is changed at frequent intervals by taking up, this practice distributing wear over wider area.

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AERIAL ropes, i. e. the fixed rope employed for travel of carriers as in the bi-cable type are subject to exactly similar stress as hoisting ropes, with the exception of the bend-over-pulley stress. Due to peculiar conditions of service vibratory stresses are particularly severe at supporting saddles, intensification at these points by arrestment leading to severe wear and a change to brittle condition of rope metal.

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HALF and full-lock design find an extensive use as the fixed rope in aerial work, and though formerly prone to cross cutting and crystallization of rope metal due to pressure of carrier wheels, these defects have been eliminated by improved construction. A new type built in tubular form is now finding wide favor due to improvements incorporated. A fairly high saving in weight is one of the improvements particularly stressed, it being possible to install ropes of this fabrication of larger diameter and less weight, thus increasing arc of contact with carrier wheels. A further improvement is that by elimination of core wear from movement of wires is practically nil., and vibratory stresses are considerably curtailed.

(*Please turn to page 147*)

Progress In Rod Baking Methods

By J. R. Morrison,
President, The Morrison Engineering Co.,
Cleveland, Ohio

A short discussion of the advances made during the past year in the recirculating methods of heating rod bakers together with installation examples. ✦ ✦ ✦ ✦ ✦

IT is a noticeable fact that the recirculation method of heating rod bakers is being accepted as the new standard by the wire industry. The old method of firing with the flues running through the bottom of the bakers has had its day and is definitely on the way out.

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IT is not our purpose at this time to discuss the different methods of heating rod bakers, but we are going to attempt to show the progress that has been made with the new recirculating type rod bakers.

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FIGURE 1 shows a three alley baker with a direct gas fired recirculating type heating system. This system is fired with the natural gas and is baking a variety of wire and rods ranging from No. 16 gauge wire to ⅝ rods, some of the product being relatively high carbon material. An interesting feature of this installation is the fact that the bakers were previously heated by electricity and were naturally free from any foreign gases.

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THE direct gas fired system was installed in 1932, and since its installation there has not been any change in the wire nor has there been any change in previous or subsequent operations. There then, is an installation where clean electric heat was replaced by the products of combustion from natural gas properly mixed with the air and the only change noticed was a reduction in baking time from three hours to one hour. The fuel consumption on this baker averages about 130,000 B. T. U. per ton of wire baked at 400° F.

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FIGURE 2 shows a new installation of a single alley direct oil fired rod baker. This system is heated by burning, what is commonly called No. 2 fuel oil, in an external combustion chamber. The products of combustion are mixed with the proper amount of air then introduced directly into the rod baking chamber.

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THIS equipment is baking a variety of rods and screw stock most of which is low carbon steel. The outstanding feature of this installation is the fact that oil is burned and introduced directly into the rod bakers without depositing any soot or carbon and without causing any objectionable smoke. The oil that is used has a certain amount of sulphur, but we have not been able to discover any objectionable effects on the limed rods. The fuel consumption on the above direct oil fired rod baker is approximately ¾ of a gallon of oil per ton of wire.

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FIGURE 3 shows a two alley direct gas fired rod baker operating on artificial gas having 530 B. T. U. content. This baker is used for baking No. 5 rods after pickling and No. 14 wire after annealing and cleaning. The interesting feature of this baker is the fact that it is direct fired with artificial gas and that the product must be in excellent condition to enable the wire to be drawn in subsequent operations at extremely high speeds.

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WHILE advances are being made in the method of heating rod bakers, we must not overlook the progress that has been made in actual baker construction. The new bakers illustrated in the accompanying photographs are constructed using highly efficient, yet economical and portable, metal panels. The panels are construct-

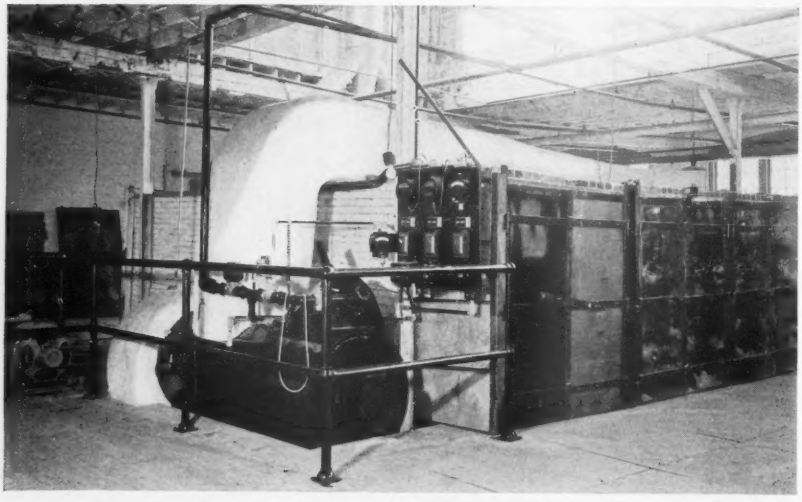

Figure 1. A three alley baker with a direct gas fired recirculating type heating system operating on natural gas. ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦

ed of No. 20 or No. 22 gauge steel sheets enclosing an insulating medium which is light in weight and impervious to the elements, yet a very efficient insulating medium.

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IN comparing the modern baker construction with the old style brick bakers, the following advantages are obvious. A light weight efficient enclosure that can be very rapidly erected or moved and re-erected without loss. Elimination of all pits and foundations as the modern baker can be erected on a flat concrete floor. The elimination of leaks and cracks around the doors as the properly constructed panel doors are tight fitting and will not get out of alignment. Perhaps the most important item is that of heat absorption, in the case of the old style bakers constructed of brick walls and containing a lot of heavy steel for supports. It is necessary to supply enough heat to raise the entire mass of bricks and steel to the operating temperature and even after the baker is up to temperature, the heat losses through the walls and roof are tremendous when compared to the efficiently constructed panels. In the case of the metal panel insulated baker, the only absorption loss is the heat required to bring up to temperature the inside exposed steel sheets of 20 or 22 gauge which is negligible.

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WITH the advances outlined above, it is apparent that a panel type baker will be very rapid in heating up and will have a very low radiation loss. These facts, of course, cover, to a great extent, the fuel required to operate a baker.

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FROM experience, it has been found that one of the most important features in rod baking is to arrange the equipment so that the wet rods when they enter the baker can be subjected to a high heat and exposed to rapid circulating air. The object being to vaporize the free water and drive off all moisture just as quickly as possible. It is this free water, if left to lay stagnant on the wire for any length of time, that causes objectionable deposits.

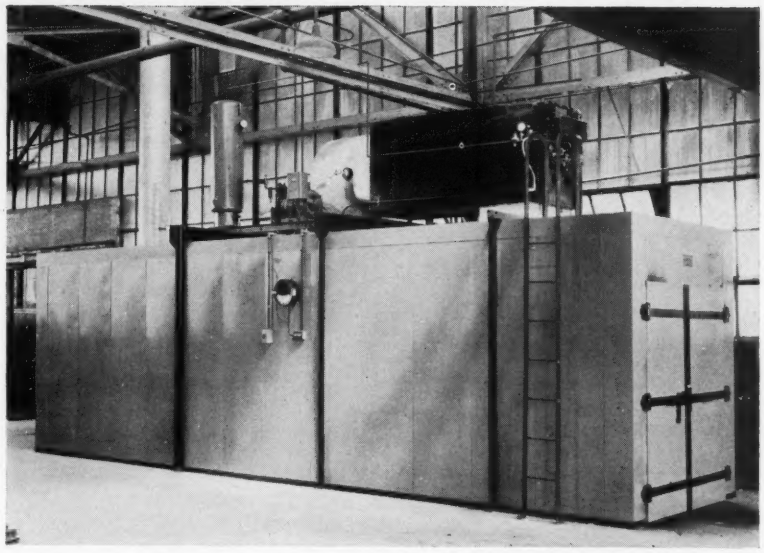

Figure 2. A single alley direct oil fired rod baker. ✦ ✦ ✦ ✦ ✦

WHEN the moisture is driven out of the lime extremely fast, the lime is left in an excellent condition to receive and hold the drawing lubricant.

✦ ✦ ✦

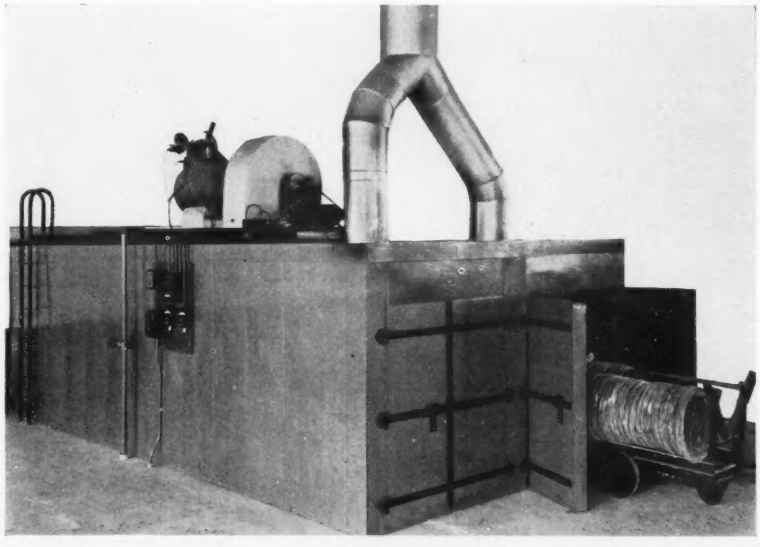

Figure 3. A two alley direct gas fired rod baker operating on artificial gas. ✦ ✦

IN regard to the recirculating of air containing water or water vapor, it is necessary in the case of direct fired bakers to vent a sufficient volume of air at baking temperature to offset the amount of water vapor being picked up from the lime and the amount of water that is in the fuel. In cases where we are introducing hot air or products of combustion at 500° F. to 600° F., this air will absorb a tremendous amount of water, and if this air is maintained above its dew point, that is, above the temperature at which it will give this water up, there is no danger of condensation, and there is no danger of the air or dry gas, as it actually is, failing to pick up more moisture.

✦ ✦ ✦

IN conclusion, it is our opinion that the modernization of rod bakers to date is only a small part of the potential advancement that can be made both in the heating, method of construction, and the method of handling the product through the baking operation.

Wire Association Questions and Answers

Question 2200

Cold Heading Wire

The Wire Association:

Will you give me such information as you are at liberty to on the following questions which relate to the production of cold heading wire?

ROD PRODUCTION

1—Is it preferable to use a hot rolled rod for cold header wire?
2—What alloys, steels and straight carbons are used (we would like to have chemical analysis of this if possible)?
3—In pickling, what acid and concentration is used?
4—What is temperature of the pickling bath?
5—How long a time is used to bake the lime on the rod; what chemical analysis and temperature?
6—What types of furnaces are used in baking and what temperatures?
7—What type of coating is used on rods for heading, trimming and extruding?

WIRE DRAWING

8—What types of wire drawing machines give the best results on this kind of wire?
9—What drawing compounds should be used?
10—In spheroidizing, normalizing and annealing, which type of treatment is preferable and what should be the temperature ranges?
11—Is there any special equipment used in cold heading, possessing special advantages of any kind?

We realize that this is rather a large order and that probably some of the information requested will not be available from you. Any information you can give on the subjects listed above will be greatly appreciated.

✦ ✦ ✦

Answer No. 1

AM replying to your letter with reference to questions asked on Cold Heading wire and hope the information will be of some service to you.

1—Hot rolled preferred, unless a person is going to draft more than two drafts (Figuring 30% reductions on each draft).

2—Open Hearth Rimmed steel. Approximate analysis; Carbon .0⅞, Mang. 29, Phos. .015, Sul. .032.

3—Between 5 and 7 per cent acid.

4—Between 160 and 170 degrees F.

5—Depends if the wire is sulled or bright. For sull one hour or more. For bright wire a half hour is sufficient otherwise wire will look dark.

6—Temperature of Baker from 250 to 350 degrees F. Either coal fired or oil.

7—A Water Sull is preferable.

8—Either single or double draft machines will do the work.

9—A powdered soap, so it will not leave a smudge on the wire.

10—Cannot answer.

11—I have found our regular mill equipment does the work very satisfactorily.

The Wire Association is for the specific purpose of improving production methods. It was organized as a clearing house of ideas on technical problems and research work in all phases of practical wire drawing and wire working.

The inquiries discussed were received from and answered by members of the Wire Association. These inquiries are sent to the Secretary of the Association who acts as a central clearing point, and neither the names of the firms or individuals sending in the inquiry, or of the men or firms replying are divulged without permission.

Answer No. 2

IN reply to your letter of January 4th, I might say that this would take a few thousand words to cover the ground for this client, who I surmise must be some foreigner. I shall briefly state as follows:

1—Cold heading wire is used in most all instances, with the exception of large rivets, in which case hot rolled rods are used.

2—For complete analysis on all steels, refer to S. A. E. specifications, which give the complete range of analysis. I know that each Steel Company makes slight variations within S. A. E. specifications to get their desired results, and that is something for the client to decide upon.

3-4-5-6—Refer to Westphal's article in the Sept., 1935, issue of "Wire & Wire Products", and that article at least will give them the lead upon which to study and seek for.

7—Refer to Seymour's article in the September, 1935 ,issue of "Wire & Wire Products", page 415, and this should give the client a lead regarding coatings.

8—I would refer the client either to the Morgan Construction Company, of Worcester, Mass., or Vaughn Machinery Company of Cuyahoga Falls, Ohio, on this item, and both concerns have my heartiest recommendation.

9—Refer to answer on No. 7, namely Seymour's article, for a general conception of what the problem is.

10—This can nicely be answered by the Electric Furnace Company of Salem, Ohio, or the Surface Combustion Company, either of whom make furnaces and assist the Metallurgical Departments of respective Steel Companies in attaining the temperature ranges to meet the personality and idiosyncrasies of each respective Steel Company's heats of steel of the various ranges covered by, for instance S. A. E. specifications.

11—This is a very general question and covering the vastness of this problem from the making of steel through all processes up to making the finished bolt, please be advised that there are many, many special advantages, each of which have been developed, claimed and protected by nearly all individual Steel Companies.

In conclusion, I would state that this is a very large order and calls for the client giving a few years of application to master a complete perspective. One might write 5000 words and only touch upon some of the details.

✦ ✦ ✦

Answer No. 3

1. THE use of hot rolled rod for cold heading stock is entirely dependent upon tolerances required in the bolt or rivet, and the analysis of the steel. The higher carbon steels can only be headed from green rods or wire drawn rods in the larger sizes. Wire drawn from rods below 3/8" in the higher carbons should be normalized.

2—In the carbon steels, analysis within the following ranges are used.

Carbon	.40/.00
Manganese	.90/.00
Phosphorus	.05/.00
Sulphur	.05/.00

3—In pickling, H_2SO_4 is used up to concentrations of 10%, depending upon plant conditions and procedures.

4—The temperature of the pickling bath is usually about 180 degrees Fahrenheit.

5—The temperature and the analysis of lime bath is entirely dependent upon the type of wire being made.

6—Open, coal or gas fired bakers, operating at a temperature of 350 degrees Fahrenheit or over, are usually used.

7—For simply heading and trimming, most any coating may be used as long as it is not sticky and does not accumulate in the header die. For extruding, a heavier coat is required and of such nature that it does not accumulate in the header die and does not become sticky in the extrusion die at the temperature developed.

8—Single draft, variable speed wire drawing machines are preferred.

9—Drawing compounds are dependent upon the finish desired and the mill producing them.

10—No generalization can be given on spheroidizing, normalizing or annealing inasmuch as again they are dependent upon the analysis of the steel and the severity of the cold heading job. The temperature for each is also dependent upon steel analysis as affecting the critical points. Grain size inherent in the steel also determines the temperatures and time.

11—There are several types of cold heading machines, using both open and closed dies, but the general principle of them all is the same. In some machines there is a multiplicity of operations, while others are single operations.

Some machines are now being built which perform a double extrusion and cold heading operation. This machine does have some special advantages in the quality of bolt produced.

✦ ✦ ✦

Answer No. 4

REGARDING your letter in reference to cold heading wire. We will be glad to give you what information we can in reference to this.

Hot rolled rods are not as desirable as

(Please turn to Page 142)

Exports and Imports of Wire

Exports of Iron and Steel Wire Products in Dec. 1935 and Dec. 1934
(In gross tons)

	Dec. 1935	Nov. 1935	Dec. 1934
Wire rods	2,943	1,796	460
Hoops, bands and strip steel	3,401	4,270	3,528
Plain black or galvanized iron or steel wire	3,177	3,783	2,821
Barbed wire and woven wire fencing	3,411	2,993	2,763
Woven wire screen cloth	103	60	66
Wire rope	259	480	149
Insulated iron or steel wire and cable—see analysis below			
Other wire and manufactures	1,117	508	338
Wire nails	1,055	1,100	1,017
Tacks	16	44	29
Other nails, including staples	183	180	259
Bolts, machine screws, nuts, rivets and washers	481	503	533
Total, these 11 classifications	16,149	15,717	11,963

Imports of Iron and Steel Wire Into the United States
(In gross tons)

Concrete reinforcement bars	362	166	37
Hollow bars and drill steel	83	88	59
Merchant steel bars	.....	.....	1,443
Wire rods	1,287	2,612	962
Barbed wire	2,192	1,486	332
Round iron and steel wire	337	253	211
Telephone and telegraph wire	.....	15	3
Flat wire and strip steel	192	204	180
Wire rope and strand	278	281	80
Other wire	145	120	52
Hoops and bands	2,140	1,597	1,033
Nails, tacks and staples	2,114	1,883	435
Bolts, nuts and rivets	22	35	8
Total, these 13 classifications	9,152	8,740	4,835

Exports Insulated Wire and Cable, December, 1935

	Foreign		To U. S. Possessions	
	Pounds	Dollars	Pounds	Dollars
Insulated iron or steel wire and cable	5,335	$ 539	.....	.....
Rubber-covered wire	402,689	102,228	90,733	$17,403
Copper weatherproof wire	52,274	8,752	28,312	4,888
Copper telephone cable	63,008	7,853	640	182
Other insulated copper wire	467,118	92,427	261,530	48,754
Nickel-chrome electric resistance wire	28,715	35,836	.....	.....
Total, these 6 classifications	1,019,139	$247,635	381,215	$71,227

Exports

DECEMBER exports (239,269 tons) were 16.9 percent higher than in the previous month, but declined (15.3 percent) from those made in the corresponding month of 1934. The most prominent gains were registered in iron and steel scrap, tin plate, and heavy rails, with losses recorded chiefly in skelp, ingots and blooms, and black steel sheets.

✦ ✦ ✦

December Exports Increase

INCREASED iron and steel sales to foreign markets were effected in December, the total of 239,269 tons mounting 16.9 percent over those made in the previous month, but declining (15.3 percent) from the December 1934 figure. Gains and losses in individual classifications were practically balanced, 32 and 31, respectively, while in one item the trade remained constant. Iron and steel scrap (with an increased total of 37,175 tons) registered the most pronounced increase, followed by tin plate (5,593 tons), heavy rails (2,936 tons), 'other plate' (1,416 tons), and galvanized steel sheets (1,936 tons). The outstanding decreases were recorded in skelp, (12,352 tons), black steel sheets (1,921 tons), and ingots, blooms, etc., (1,514 tons).

✦ ✦ ✦

Where December Shipments Went

EUROPE regained its position as the leading market for iron and steel products from the United States taking 38.4 percent of all shipments effected during the month (as against an average of 28 percent for the entire year). The Far East followed and accounted for 34.2 percent (46 percent), flanked by North and Central America and the West Indies whose receivings were 17 percent of the aggregate (18 percent). Next was South America whose proportion was 7.8 percent (6.2 percent), while Africa with a share amounting to 2.4 percent (1.8 percent) came last.

✦ ✦ ✦

JAPAN was the leading individual market from a tonnage standpoint, its total of 46,230 tons being made up for the most part, of iron and steel scrap (36,574), waste—waste tin plate (3,323), tin plate scrap (2,445), wire rods (1,810), and tin plate (1,480). The United Kingdom was next, its trade of 40,968 tons being practically all confined to iron and steel scrap (39,835 tons). Following was Italy likewise confining its trade (35,463 tons) mostly to iron and steel scrap (35,158). Canada had a varied trade involving 22,413 tons made up principally of iron and steel scrap (7,726), skelp (3,102), black steel sheets (2,408), plain shapes (1,432), and hot-rolled strip steel (1,263). China was the fifth market with a total trade of 15,165 tons of which the outstanding items were iron and steel scrap (8,190), heavy rails (3,824), and tin plate (1,559).

✦ ✦ ✦

December Imports Continued Downward Trend

THE downward trend of imports in iron and steel continued during December when the total (53,678 tons) fell 5.4 percent short of the November volume. However, the trade during the comparable month of 1934 was surpassed by 33,790 tons, the November 1934 total being very low.

✦ ✦ ✦

Sources of December Imports

THE leading supplier of iron and steel products to the United States during December (on a tonnage basis) was Canada chiefly by reason of large scrap shipments. Following scrap (10,082 tons), Canada's aggregate trade of 13,751 tons involved chiefly spiegeleisen (2,709), and pig iron (694).

(*Please turn to page 152*)

A Review of Recent Wire Patents

NO. 2,026,686, BOLT, Patented January 7, 1936 by Arthur A. Kirley, New York, N. Y.

The assembly includes a shell having an outer wood screw thread and an inner machine screw thread with a split portion at one end of the shell, and a screw adapted to enter the shell from the opposite end and engage the inner thread, the screw expanding the shell when the bolt is employed.

✦ ✦ ✦

No. 2,026,843, FURNITURE SPRING SEAT, Patented January 7, 1936 by Charles C. Meutsch, Buffalo, N. Y.

Resiliency is obtained by the use of a number of metal springs and a number of sets of which act in series with each other so as to enable one set to safely oppose very light external loading and at the same time to back this "soft" set of springs by a second and third set of springs (helicals and elastic bars) so that intermediate and heavy loads are also supported.

✦ ✦ ✦

No. 2,027,778, WOVEN WIRE SCREEN CLOTH, Patented January 14, 1936 by John H. Holtzapple, York, Pa., assignor to New York Cloth Company, New York, N. Y., a corporation of Del.

At the selvage end of this wire screen cloth, there is disposed a flattened wire and a round wire in contact with each other and together presenting a surface quite wider than the diameter of any of the conventional warp and weft wires, and adapted to receive a background for suitable indicia printed upon the flattened wire.

✦ ✦ ✦

No. 2,027,787, WIRE DRAWING DIE, Patented January 14, 1936 by Raymond R. Ridgway and Bruce L. Bailey, Niagara Falls, N. Y., assignors to Norton Company, Worcester, Mass., a corporation of Mass.

A die is provided, shaped as a perforated nib of required dimension having a wire drawing surface, the effective portion of which comprises boron carbide of the formula B_4C.

✦ ✦ ✦

No. 2,028,122, TERMINAL END FOR COILED SPRINGS, Patented January 14, 1936 by Alvin H. Floreth, Chicago, Ill., assignor to Gardner Wire Co., Chicago, Ill., a corporation of Ill.

Specifically, the terminal end consists of a spiral wire spring having a plurality of convolutions of greater pitch than the convolutions of the spring which are engaged by the terminal end so as to force the engaged spring convolutions to a wider pitch than their normal pitch and maintain the engaged convolutions under tension.

✦ ✦ ✦

No. 2,028,155, WIRE ROPE LUBRICATION, Patented January 21, 1936 by Walter D. Hodson, Chicago, Ill.

This lubricant is of the plastic, jelly-like adhesive type, and includes a top drier in proportions to produce a tough, leathery surface on exposure of the lubricant to air, without at the same time affecting the body of the lubricant.

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 17 East 42nd St., New York.

No. 2,028,156, WIRE ROPE, Patented January 21, 1936 by Walter D. Hodson, Chicago, Ill.

The rope is of the type comprising a number of strands of wire wound about and pressing upon a fibrous core. The latter has finely divided asbestos loosely premeated therethru, as well as a lubricant distributed throughout the core and asbestos.

✦ ✦ ✦

No. 2,028,157, WIRE ROPE, Patented January 21. 1936 by Walter D. Hodson, Chicago, Ill.

The inventor contemplates a twisted wire rope wound about a central core and having within and about the strands the wire rope lubricant described in patent 2,028,155.

✦ ✦ ✦

No. 2,028,178, ELECTRIC CABLE, Patented January 21, 1936 by Robert J. Wiseman, Paterson, N. J., assignor to The Okonite Company, Passaic, N. J., a corporation of N. J.

For the transmission of high tension electrical energy, this inventor provides a flexible imperforate enclosing casing with a conductor insulated with a solid water-impervious material of high dielectric strength which is capable of being improved by the application of pressure thereto, the material being loosely enclosed within the casing.

✦ ✦ ✦

No. 2,028,652, DRAWING OF WIRES, Patented January 21, 1936 by Jean de Mulatier, Sainte-Foy les Lyon, France.

According to this invention, several dies are disposed in succession with each other, disposed co-axially in the same die holder and the wire is passed thru them at the same time on its way to the drawing spool.

✦ ✦ ✦

No. 2,028,716, FIRE RESISTANT ELECTRICAL CONDUCTOR, Patented January 21, 1936 by Myron E. Delaney, Bloomfield, N. J., assignor to Halowax Corporation, New York, N. Y., a corporation of Delaware.

Instead of employing chlorinated naphthalenes as the principal ingredient of the wire covering, this inventor adds to the chlorinated naphthalenes chlorinated diphenyl and an inert substance such as fuller's earth or clay. It is stated that the inert material takes care of surface heat and the chlorinated diphenyl prevents cracking of the covering.

✦ ✦ ✦

No. 2,028,793, INTERFERENCE PREVENTING CABLE, Patented January 28, 1936 by Joseph J. Mascuch, Newark, N. J.

For use particularly in automobiles, aeroplanes and the like this inventor has patented a flexible conduit to protect and electrically shield electric wires employed in ignition systems.

✦ ✦ ✦

No. 2,029,038, ELECTRIC CABLE, Patented January 28, 1936 by Thomas R. Scott and Thomas E. D. Menzies, Aldwych, London, England, assignors to International Standard Electric Corporation, New York, N. Y., a corporation of Delaware.

This cable is of the oil impregnated type and has incorporated therewith a temperature-controlled fluid pressure equalizer.

✦ ✦ ✦

No. 2,029,076, INNER SPRING MATTRESS, Patented January 28, 1936 by Edward D. Leeman, Medford, Mass.

More specifically, the invention lies in the provision of reinforcing means at the edge of the wire spring mattress in order to strengthen this edge.

✦ ✦ ✦

No. 2,029,182, FURNITURE SPRING SUSPENSION, Patented January 28, 1936 by Charles C. Meutsch, Buffalo, N. Y.

While the major portion of this construction comprises band iron springs instead of the conventional helicals, the inventor does provide coil springs at either end of the band iron springs.

✦ ✦ ✦

No. 2,029,206, METHOD AND MACHINE FOR DRAWING OR PULLING WIRE, Patented January 28, 1936 by George N. Williams, Kokomo, Ind., assignor to Continental Steel Corporation, Kokomo, Ind., a corporation of Ind.

Included in this construction is a rotatable wire drawing block with means for rotating the block and wire severing means rotatable with the block and adapted to sever wire thereon during rotation thereof, the severing means being actuated at predetermined intervals so that predetermined lengths of severed wire are produced from the main wire body. There are fifty-five patent claims in this patent.

STEEL WIRE

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650 pages. 450 charts, photomicrographs and illustrations

✦ ✦ ✦

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SEND ORDERS TO

WIRE and WIRE PRODUCTS

17 E. 42nd Street, New York

'Round the World With the Wire Industry

Improved Competitive Position of United States in Canadian Market

THE improved competitive position of the United States in the **Canadian** iron and steel market was evident during the August-October 1935 period. Receipts from that source were valued at $5,729,126, a substantial gain of 45 percent over the figure for the corresponding period of the previous year. Imports from the United Kingdom during the same period reached a value of $4,843,973, a gain of 25 percent. Canadian imports of the principal iron and steel items kept pace with gains registered in domestic production during the period.

✦ ✦ ✦

CANADIAN exports of iron and steel products during the reviewed period were valued at $2,910,861 which was an increase of 42 percent over those made during the comparable period of the earlier year. The outstanding gains occurred in shipments of "pigs, ingots and billets (and ferromanganese)", scrap, and rolling mill products (rails to secondary markets).

✦ ✦ ✦

Agitation in Japan for Increased Duties on Hoop Iron

THE successful manufacture of hoop iron by the Nippon Aento Kogyo K. K., and Tokuyama K. K. during 1935 has caused considerable agitation in **Japan** for increased duty on this product. An annual capacity of 120,000 metric tons is now claimed by the companies named. In addition the Fuji Works of the Japan Steel Works plans to undertake production of this product in the near future. It is claimed that domestic output will soon be in excess of consumption, leaving an exportable surplus. Imports during 1934 amounted to 76,621 tons of hoops and bands, and 7,540 tons of "ribbons" chiefly supplied by Belgium (70 percent), the share of the United States being negligible. Arrivals during the first ten months of 1935 totaled 49,600 tons (25 percent less than in the comparable period of 1934). It is thought probable that a bill to increase the tariff will be introduced at the next session of the Diet.

✦ ✦ ✦

Canadian Producer Adds Tin Plate and Cold Rolling Mill

THE Hamilton, **Canada,** plant of the Dominion Foundries and Steel Company has recently completed the addition of a new tin plate and cold rolling mill at a cost of some $500,000. An additional unit is planned which will give the plant a daily capacity of 100 tons of cold rolled steel.

(*Please turn to page 138*)

MICROMETER PRECISION MICRO-WELD TRADE MARK REG. U. S. PAT. OFF.

Micro-Weld Butt Welders

The increasing use of these efficient butt welders by leading wire manufacturing and fabricating plants throughout the world, is evidence of the superiority of MICRO-WELD design and construction.

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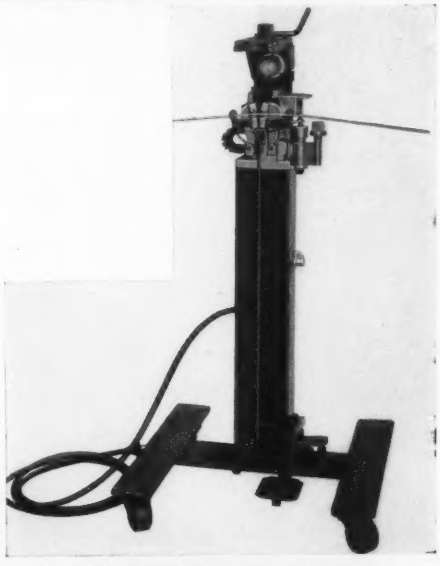


MICRO PRODUCTS COMPANY

20 NORTH WACKER DRIVE, CHICAGO, ILL.

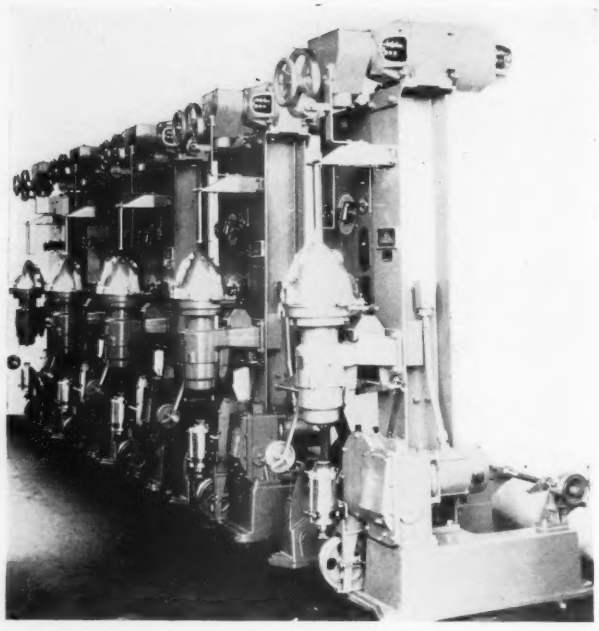
Telephone State 7468 General Office and Factory, Peoria, Ills.

'Round the World With the Wire Industry

(*Continued from page 137*)

New Zealand Government Considering Subsidization of Onekaka Iron and Steel Works

SERIOUS consideration is being given to subsidization of the Onekaka iron and steel works by the **New Zealand** Government. The works in question have been closed for several years. This plant—with assistance—can produce pig iron (imported chiefly from Australia at present) at a cost of some £4: 15 shillings per ton, it is estimated. Approximately 64,000,000 metric tons of iron ore deposits are said to be located in Nelson Province of the South Island in the vicinity of the Onekaka plant.



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German Wire Cartel Reports Good Business

THE German wire cartel reports that new orders for wire products in Germany are being booked at a satisfactory level, as the winter prices this year have induced many buyers to place orders (special rebates for orders booked between December 1st-January 20th). The export demand has been satisfactory, and there has been very little outside competition. The conditions on the export markets are such that there is virtually no outside competition from industries in the IWECO countries, and the Swedish industry is now selling at prices which more or less are almost equal to the IWECO prices, while the British quotations are in some cases even higher.

✦ ✦ ✦

Belgian Mills Increase Rod Capacity

TWO Belgian works (Clabeq and Providence) have recently expanded the production capacity for wire rods. It is thought that the expansion of production will bring difficulties to the wire rod cartel. However, it is now certain that the international wire rod cartel will face no difficulties in this development and that the extension as well as the market regulation scheme will have no obstacles. It is, however, possible at present to buy wire rods at the official quotations of £ 4.10 (gold), which was impossible a few weeks ago.

✦ ✦ ✦

Japanese Export Prices Higher

IT is of interest that Japanese export quotations have been higher the last year. The average value of exports was approximately 8% higher per ton in 1935 than in 1934, and though it is not possible to draw final conclusions from this comparison, it can be said that the prices for Japanese wire products are higher, due to the general rise of production costs in Japan.

'Round the World With the Wire Industry

Rumors, however, that the IWECO is again in negotiations with the Japanese industry concerning an agreement to regulate prices, have been again denied. The IWECO has not sent any delegation to Japan as had been reported by a few newspapers.

✦ ✦ ✦

German Wire Netting Demands Heavy

THE very heavy demand for wire netting is still continuing in virtually all markets. Shipment dates are still very extended and thirteen or fourteen weeks is no exception but the rule. The agreement with the British wire netting manufacturers' association is working well and it is probable that the agreement will soon be extended for the period of another year. Prices are unaltered and firm.

✦ ✦ ✦

Brass and Copper Wire Market Good in Germany

THE demand for brass and copper wire is also heavy. Chiefly due to the circumstance that Italian competition in brass wire has ceased, the German industry has received such orders that shipment dates for 25 G. brass wires and thinner is not less than one to fourteen weeks, and thicker brass wires, ten to twelve weeks. The German industry is working at nearly 100% capacity. Shipment dates for copper wire have been extended and are now ten to twelve weeks for thin wires. Prices are firm and show a tendency to rise further. Italian sales of brass wires to the Colonies are heavy, but Japanese copper and brass wire continues to sell in Italy.

✦ ✦ ✦

Reported That Soviet Russia Will Increase Nail Output

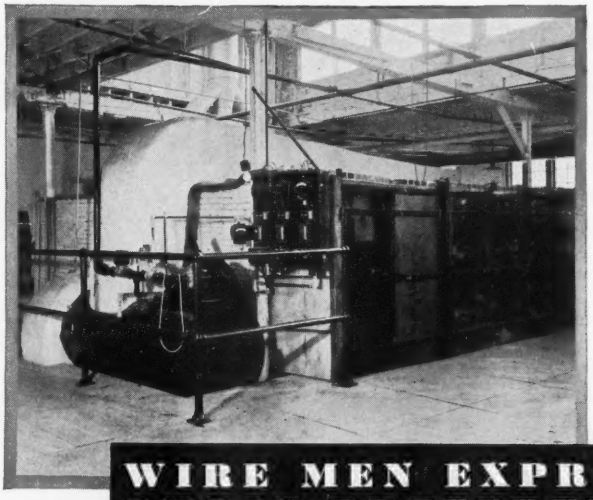
NAILS are now being produced in 23 plants located in the **Soviet Union,** according to unofficial advices, and the Council of Labor and Defense is said to be considering increasing the output. Plans in 1935 called for an output of 145,000 tons of nails, and it is said that the demand was estimated at some 250,000 tons. Decision is stated to have been reached looking towards an increase in the output of wire for nail manufacture, as well as to the substitution of new machinery for old.

✦ ✦ ✦

A VERY interesting booklet on fatigue describing how it affects the users of wire ropes and how a fatigue test can be used to ensure the best properties in wire, has just been issued by Bruntons (Musselburgh) Ltd., of Scotland.

✦ ✦ ✦

COPIES of this booklet can be obtained by addressing the Editor.



WIRE MEN EXPRESS THEIR PREFERENCE

As you read this, there are more Morrison rod bakers being installed than at any other time in the history of the company. Why? Increasing wire mill production coupled with competition that calls for the utmost in manufacturing economies, demands equipment geared to more modern requirements. At no added cost of fuel or increase in space, Morrison rod bakers can possibly double present production and, at the same time, improve working qualities of the wire. That's the reason for the present swing toward Morrison equipment. Have you considered this in connection with your own mill? A letter will bring you further information.

MORRISON ENGINEERED

Other Morrison equipment is designed for annealing, heat-treating, and galvanizing; tank and pot heating; and other industrial process heating applications utilizing the recirculating forced convection method.

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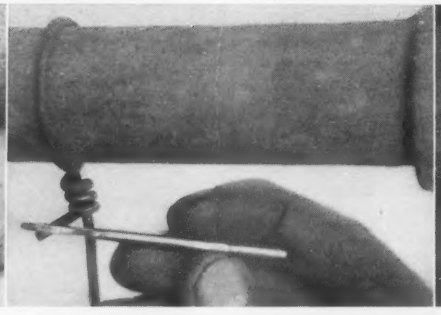
Odd Uses For Discarded Wire

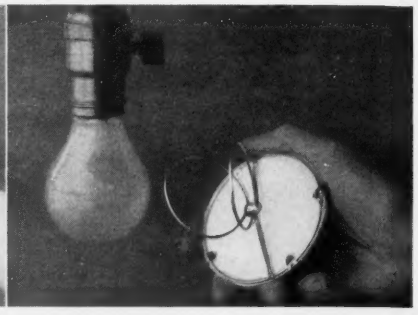
To Quickly and Easily Straighten Point of a Stiff Wire Thumbtack

THE stiff wire points of heavy thumbtacks ordinarily used for many purposes are often bent as a result of hurriedly forcing them into hard surfaces with none too direct a pressure on the head. With a good supply of tacks on hand, this is no annoyance to be sure, but quite frequently one has just enough tacks at hand for use. Without tools, a tack point of this nature is a mean thing indeed to straighten, as anyone knows who may have tried it. However, it can be neatly, easily and quickly done with a small key, always handy with the rest of them on the usual ring. Select a small key with a hole in the end of it. Drop the bent point into the hole which will neatly hold it. Then simply press down on the high portion of the tack head. An easy leverage is afforded in this manner. Withdraw the point and press again if necessary should the point be badly turned and bent. Such tack points are quite easy to straighten in this manner with no damage to the small steel key.



Key Handle Makes Excellent Emergency Tool

TWISTING or winding a fairly heavy wire to make an emergency fastening or repair frequently has to be done in a pinch with the bare fingers when one of course happens to be without pliers or tools of any kind. The handle or eye of the common house key, generally in the pocket on the key ring can be used to make as neat a job as one can do with pliers of any kind, even better. Slip the end of the wire through the hole in the handle. Rest the bottom of the handle over the connecting or other part of the wire and turn the key easily around it. It will wrap the wire closely and coil it as neatly as any special tool. The key handle makes just as good an improvised tool for unwinding the wire, an operation which is just as hard and almost impossible with the bare fingers. If there is any strain at all on the wire, it must be snugly and closely wound in this manner or it is quite liable to pull loose and away. The key handle makes this frequent emergency little job, a surprisingly easy one.



A Novel Reclamation of Wire Portion of Parlor Lamp Shade

THE wire ring and globe snap of common decorative parlor lamp shades is a very common discard, being thrown away when the paper shade portion deteriorates in color and freshness. The above photo however shows a novel reuse of this part in making a spot shade, very handy around the workbench, storeroom, and other places where the light from one direction is an annoyance, but in another a requirement. A thin sheet of asbestos is cut to the size of the ring, and secured to it with common paper fasteners. This is of course heat and fireproof. It's practicality lies in the fact that it is easily and quickly moved and adjusted to any position and to about any angle on the light bulb, and instantly removed if desired. The white asbestos makes it an excellent reflector, throwing much of the light in the direction desired.

OVERHEAD MATERIALS HANDLING

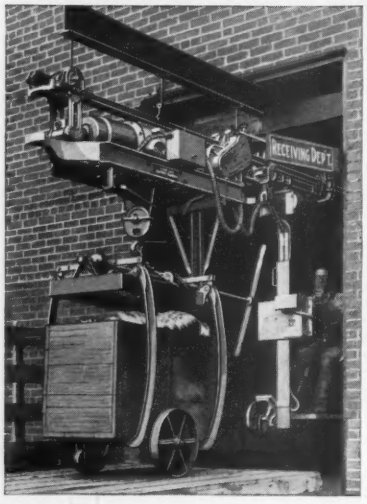


Photo T-1464

Photo T-1172

Photo T-1464
A Platform Controlled Carrier operating on a grade of 5%.

Photo T-1172
Single Suspended Hair Pin Hook handling 1800 lb. loads of rod and wire.

Rod and Wire Storage . . . .

• There is Cleveland Tramrail equipment suitable for handling medium sized loads on a single hoist, suspended Hair Pin Hook, requiring a floor man; up to 3600 pound loads on double suspended Hook, having all motions of carrier, hoist and Hair Pin Hook, controlled by one operator in the Cab; no floor man required.

Consult your 'phone directory under Cleveland Tramrail.

CLEVELAND TRAMRAIL

DIVISION OF
THE CLEVELAND CRANE & ENGINEERING CO.
WICKLIFFE OHIO

Outstanding Personalities of the Wire Industry

L. F. JORGENSON
Special Representative
KEYSTONE STEEL & WIRE CO.
Peoria, Ill.

Keystone Steel & Wire Co. Appoints L. F. Jorgenson Special Representative

L. F. Jorgenson has been appointed Special Representative for the Keystone Steel & Wire Co. of Peoria, Ill., handling wire and nails for the manufacturing trade.

✦ ✦ ✦

MR. Jorgenson was formerly connected with Keystone, in the capacity of retail salesman, and this background, coupled with actual steel mill experience makes him well equipped for the new job. His headquarters will be Cincinnati.

✦ ✦ ✦

Management Changes at General Electric's Ft. Wayne and Philadelphia Works

NEIL Currie, Jr., for the last six years manager of the General Electric Company's Philadelphia Works, was made manager of its **Fort Wayne Works** effective February 1st, it was announced recently by W. R. Burrows, vice president in charge of manufacturing. Mr. Currie succeeds **Walter S. Goll** who, although retiring as manager after 38 years of service, will continue with the company and will be available for special assignments. **R. V. Good,** previously assistant manager at Philadelphia, was appointed manager to succeed Mr. Currie.

✦ ✦ ✦

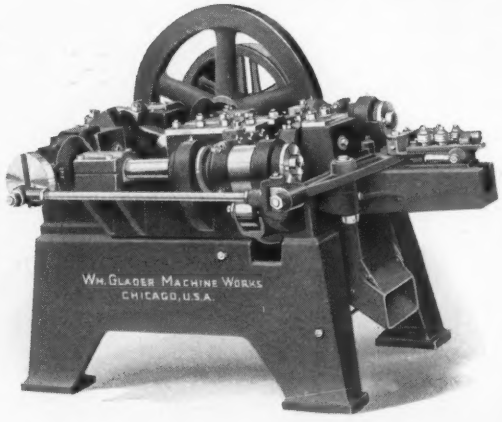
MR. Currie was born in Currie, Minnesota, and was graduated from the University of Minnesota in 1908 with the degree of electrical engineer. In June of that year he entered the employ of the Western Electric Company in the power apparatus department, and with the purchase of this department by General Electric joined the latter's motor department at Pittsfield. In 1911 he was named assistant engineer of the power motor engineering department, and in 1920, engineer. Five years later he became managing engineer, and in 1929 was named manager of the Philadelphia Works.

MR. Goll, a native of St. Louis, graduated from Cornell University in 1896 with a degree in mechanical engineering and was first employed by General Electric in the drafting department of the Schenectady works in 1897. He resigned the following year to join the Siemens-Halske Company in Chicago, which was taken over by General Electric in 1901. In the same year Mr. Goll was made manager of the Chicago office of the

(*Please turn to page 154*)

GLADER

HIGH SPEED WIRE NAIL MACHINE



Machines are built in nine sizes to cover a range of nails from 15 gauge 1/4" long to 3/8" diameter 12" long, including large head roofing nails.

A month's operation of one of our latest type machines will produce an average of more than 200 pounds of 8d common nails per hour.

These machines are well liked by operators, due to the fact that adjustments are easily made and can, in most instances, be made while the machine is in operation.

The performance of these machines, both as to production and low maintenance cost has led to their exclusive selection in all of the recent major nail making machine installations.

WM. GLADER MACHINE WORKS

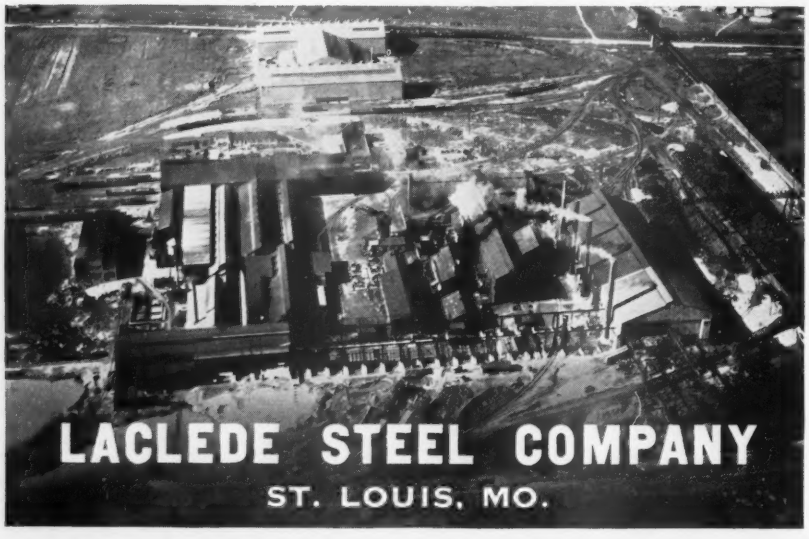
210 N. RACINE AVE. CHICAGO, ILL.

QUALITY PRODUCTS FROM MODERN FACILITIES

Laclede Wire meets all the demands of modern industry. It is produced by the latest principles of manufacture in an organization equipped to satisfy the requirements of the exacting process from the making of the steel to the final inspection of the finished product.

Whether wire is a new item in your manufacturing program or one of long standing; whether your problem is one of finish, uniformity or coating—we feel confident that our organization could be of real service to you.

Alton Works, Alton, Illinois



Wire Association Questions and Answers

(*Continued from page 134*)

drawn wire for cold heading because of the non-uniformity of the rod both as to size and shape and also the grain structure, the grain structure of the rod being very uneven on account of the difference in time in cooling the strands on the outside of the coil and those on the inside.

For ordinary cold heading, low carbon steel of approximately Carbon .08 max., manganese .30 to .40, phos. .02 max., sulphur .04 max., open steel is generally used and given one light draft from the rod. On the more difficult heading jobs, annealed and cleaned wire is used. This is softer and more ductile and will flow better in the dies.

There are a number of customers who require a special alloy steel for their work, but these people generally have their own special analyses.

In pickling we use 60° sulphuric acid at an acidity of about 3% to 4% heated to approximately 175° to 200° F., the temperature depending upon the amount of iron salts in the acid. The higher the iron content, the higher we have to run the temperature.

The coating is generally a very light lime and ordinarily baked for about two to three hours in an ordinary baker at approximately 375°. These bakers can be either gas, oil, or coal fired. We have tried coal fired and natural gas, and both are satisfactory.

Some customers demand a heavy sull-coating on their wire, claiming this will cause the steel to flow more freely and fill in all corners more perfectly.

In asking which machine is best for drawing this wire, different wire people have different preferences. Our preference would be the Vaughn single block, or so-called bull block.

The compound we like best for drawing this grade of wire is a mixture of dry lime and old wire drawing soap, as this leaves a fairly clean wire free from grease.

If a heat treatment is necessary, we believe the ordinary annealing at a temperature of 1250° to 1350° F would be satisfactory. Anything below the ordinary critical range with slow cooling.

The cold heading can be done on any ordinary cold heading machine similar to a nail, screw, or bolt machine, equipped with tools or dies to the shape of the upset desired.

We have had no experience in spheroidizing. We understand that this gives a more ductile steel than the ordinary annealing.

✦ ✦ ✦

Answer No. 5

Subject: Bolt Wire

NO doubt you realize that to reply in any detail to your questions on this subject would get me into writing a book. However, if general information will serve for the present, here is some.

Question 1

Item a. Carbon steels .08 to .25 carbon account for the greatest tonnage of cold headed bolts. Carbons from .35 to .40 are used in bolts to be heat treated, particularly cap screws for the automotive trade. Alloy steels are used where tensile strength over 150,000 is needed,

the grades being chiefly chrome, nickel-chrome, and chrome-molybdenum, but straight carbon steels up to .60 are also used. Silicon bronzes, nickel-aluminum bronze and monel metal give good physical properties and resistance to corrosion Brass, nickel, copper, and nickel-silver have minor uses.

Items b and c. In the steels, sulphuric acid is in practically universal use. Concentration, temperature and time may be varied through a wide range. Bonzel's book has much interesting information on this matter. Concentration is generally between 5 and 10% by weight, temperature 160 to 200 Fahrenheit, and these are generally chosen to match with an immersion of about 30 minutes.

Items d and e. In the matter of lime, physical as well as chemical character is significent and while some companies set up chemical limits nobody feels entirely sure that they are adequate. Limes outside the generally recognized limits sometimes do very well, and vice-versa. Magnesia seems to cause the lime to lack adhesion. Silica of course is harmful, but in certain forms a considerable amount of it may be tolerated. As only about 2 pounds of lime is consumed per ton of wire it pays to take no chances. There is plenty of good lime available and too much purity never did any harm.

Baking is generally done at 250 to 350 F., and the time ranges from 30 minutes to several hours. A modern insulated panel baker with convection heating and lively circulation will do better in 30 minutes than an old-fashioned baker in many hours. With poor regulation and leaky flues the longer the baking the worse the job is. Much bolt rod, especially coarser than ¼", can be processed quite satisfactorily without any baking whatever.

Item f. As a rule a coating that is good in heading and extruding is equally good in drawing the wire, as the operations are fundamentally alike. The ideal coating is one thick enough to give a low coefficient of friction and yet thin enough or hard enough not to plug the corners of heading dies. There are two schools of thought on this matter, one tries to build up a thick coating, using an extremely heavy lime coat and much lubricant of such a nature as to give a thick plastic but hard film, the other using a very light lime and a light grease or even a vegetable oil. I have even had excellent results with a water soluble film so thin that the wire had a mirror finish.

The thick films are usually the product of heavy lime and a soap which is usually sodium stearate or one of the metallic stearates, notably aluminum.

Question 2

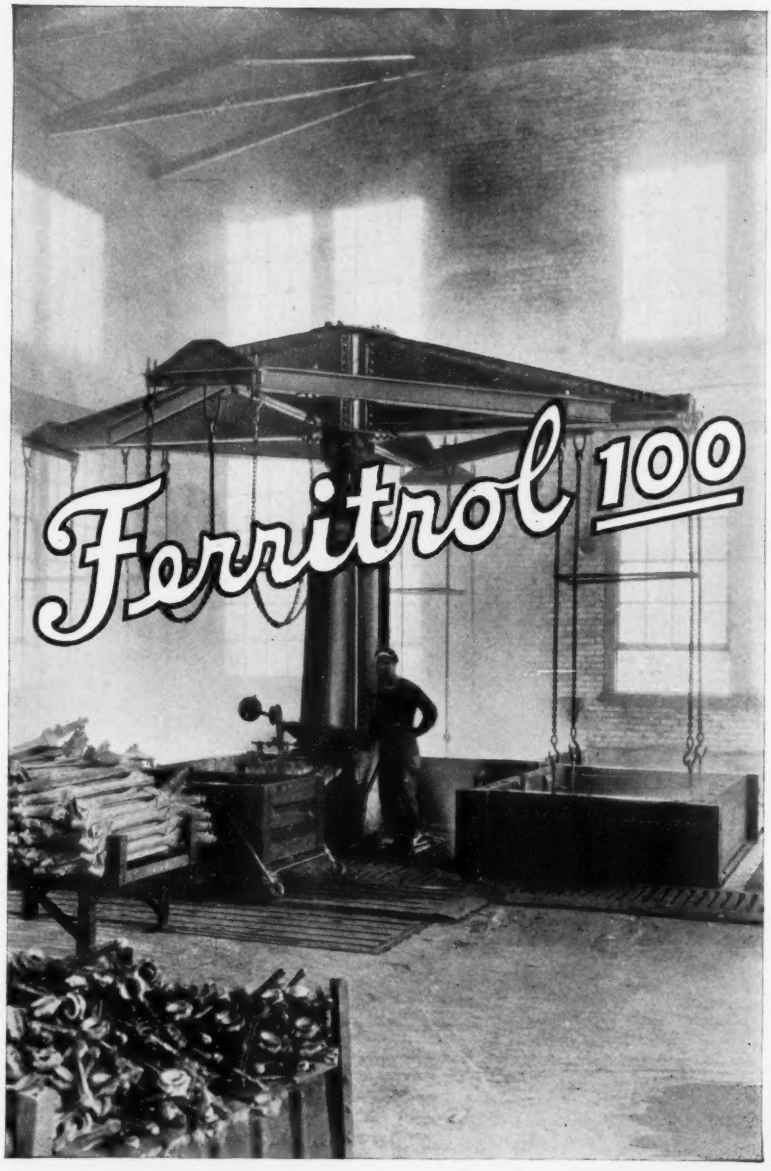
Item a. The nature of the drawing machine affects nothing but the cost of drawing. Rod benches and bull blocks built by Vaughn, Morgan, Waterbury Farrel, Broden, and others, are all in wide and successful use.

Item b. Already answered.

Item c. The low carbon steels are usually rimmed, and so have a thick skin of nearly pure iron. They need no treatment unless they have been improperly handled at the rod mill. The higher carbons, whether or not the finished bolts are to be quenched, need careful preparation. They should be so treated in

(*Please turn to page 144*)

For Modern Pickling--



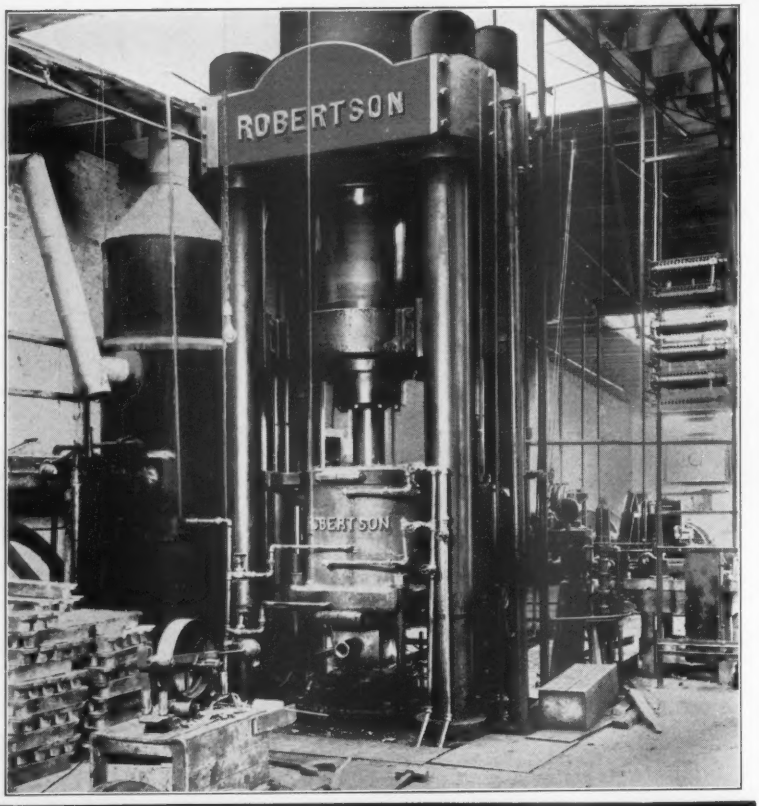
This latest development in inhibitors possesses points of superiority that are entirely proven:

Ferritrol 100 has greater strength, lower cost, less breakdown at high temperatures or over a period of time, and leaves a whiter surface, chemically clean, for further operations. It stops pitting, reduces hydrogen brittleness, prevents over-pickling.

Write for Bulletin No. 2

E. F. HOUGHTON & CO.

240 W. Somerset St., Philadelphia, Pa.



The ROBERTSON Lead Encasing Press was chosen by this well-known Electrical Cable Manufacturer

Why?

A leader in the industry, this manufacturer chose the leader in ITS field—the Robertson Lead Encasing Press. Chose it because we told him (and now tell YOU) this: "This press assures an unvarying, standard output of uniform lead sheath. It will operate economically and efficiently . . . it will give dependable service and long trouble free operation. It is scientifically designed and precision built. Into it has gone the engineering knowledge and experience gained from years of specialization in the manufacture of hydraulic equipment. We back it with the reputation earned during 78 years in business. Whatever the comparative first cost—you will find it costs less in the long run."

The facts that back these statements are available upon request. Why not write today? There is no obligation.

John ROBERTSON CO. INC. *Pioneers-Since 1858*

125-37 Water Street Brooklyn, N. Y.

Wire Association Questions and Answers

(*Continued from page 143*)

the fluid state as to solidify with a coarse austenitic grain, as revealed by the McQuaid-Ehn test, unless the bolts are to be water-quenched, in which case a fine austenitic grain is permissible. The rods are usually "normalized," but this normalizing is not the treatment generally known by that name. The rods are heated to a point about 200 F. above their critical point and given a rather slow controlled cooling to secure a large grain. If the steel is of a fine inherent grain it won't respond to this treatment but can be put into fair shape for plastic flow by spheroidizing, which is just a name for a low temperature anneal (1400) and slow cooling, which partially spheroidizes the structure and permits it to flow with fair uniformity. This spheroidized steel is rather hard to heat treat later, as the carbides dissolve very slowly.

Much attention is being paid to grain size; not the inherent or austenitic grain size, but the size of grain induced by normal heat treatment. Users are to a large extent specifying grain count in cold heading steel.

Item d. Little is known about the effect of the Hogue process. It is sold on a basis of convenience and cost. I think it entirely possible that steel coming to the heading dies a few seconds after drawing is considerably more plastic than it would be at any other time. Studies of ageing phenomena certainly suggest this very strongly. It is probable that the same effect could be produced more economically.

I hope this outline will help you a little. Most of the statements made are subject to modification, some almost to reversal. All these factors react on each other in complex ways. You can get a dozen brief answers to your questions from as many sources, but they will not make a connected story.

✦ ✦ ✦

Answer No. 6

THIS is in reply to your letter in which you seek information on several questions relating to the production of cold heading wire.

Question No. 1—Naturally it is a wire man's opinion, that it is preferable to use hot rolled rods for cold heading wire.

Question No. 2—A Rimmed or Open Steel should be used. Our analysis—Copper .08; Sulphur .04; Phosphorus .02; Manganese 30 to 35.

Question No. 3—We carry about a 4 per cent solution of Sulphuric Acid.

Question No. 4—Temperature of our Pickling Bath—180 degrees.

Question No. 5—The temperature of our Lime Bath is right at 200 to 212 degrees, and we bake for about four hours.

Question No. 6—We use an ordinary type tunnel furnace at a temperature of about 350 degrees.

Question No. 7—We use a heavy Sull or Rust Coat. Also for some kinds of wire, a light copper sulphate dip or coat.

Question No. 8—Any kind of Wire Drawing Machines. Slow speed being preferable in some cases.

Question No. 9—We use grease.

THIS unusual moving display of Keystone Steel & Wire Co., Peoria, Illinois, is in current use at conventions of interest to wire spring manufacturers and other spring wire users.

✦ ✦ ✦

ON the well-lighted miniature stage in the center of the display a suspended 50-pound weight is constantly raised and lowered by concealed mechanism. Directly under this weight is a coiled "SAMSON" wire spring which the weight compresses and releases as it is lowered and raised. The pointer above moves back and forth with each movement of the weight. This action display demonstrates the great durability and elasticity of "SAMSON" spring wire, in a most impressive manner.

✦ ✦ ✦

ACTUAL life size sections of "SAMSON" wire in various spring constructions are displayed on pedestals flanking the stage. Brilliant lighting effects further add to the eye-appeal of the complete display.

Question No. 10—I am not familiar with.

Question No. 11—I do not know.

I don't know, whether or not this is general practice for cold heading wire, but it is with us here.

✦ ✦ ✦

Answer No. 7

RELATIVE to your letter, requesting certain information relating to the production of cold heading wire, we are offering the following answers to the questions as listed:

Rod Production

Q. 1—Is it preferable to use a hot rolled rod for cold headed wire?

A.—This is dependable to a considerable extent on the type of finish required on the product to be headed, but generally speaking we believe that wire is to be preferred.

Q. 2—What alloys, steels and straight carbons are used (we would like to have chemical analysis of this, if possible)?

A.—Carbon steels up to around .40 carbon.

Q. 3—In pickling, what acid and concentration is used?

A.—Sulphuric acid in concentrations varying from about 5% to 9% depending upon the carbon analysis. Bessemer steels and the higher carbon open hearth grades naturally require the lower acid concentration.

Q. 4—What is temperature of the pickling bath?

A.—Lower carbon steels generally require bath temperatures of around 170° to 180°, higher carbons and bessemer steel generally around 140° to 155° F.

Q. 5—How long a time is used to bake the lime on the rod; what chemical analysis and temperature?

A.—Baking time of approximately three to four hours; by chemical analysis we presume is meant lime concentration which varies considerably of course, depending upon the type of lime coating desired and may run from about 2% to 6%; temperature of lime bath generally around 160 to 180° F.

Q. 6—What types of furnaces are used in baking and what temperature?

A.—Regular gas-fired baking oven.

Q. 7—What type of coating is used on rods for heading, trimming and extruding?

A.—Generally a light lime coat.

Wire Drawing

Q. 8—What type of wire drawing machines give the best results on this kind of wire?

A.—We have no definite information to offer on the question.

Q. 9—What drawing compounds should be used?

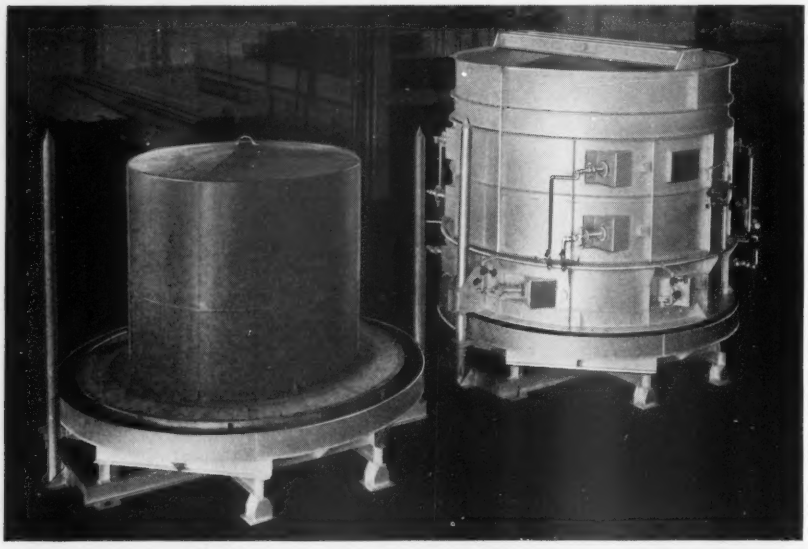
A.—The answer to this question is dependent to a considerable extent on the type of heading and the product being headed; generally speaking soaps, either vegetable or mineral are preferably used.

Q. 10—In spheroidizing, normalizing and annealing, which type of treatment is preferable and what should be the temperature ranges?

A.—Any one of these treatments might be used, depending upon the type and extent of cold heading; generally speaking however we find that the proper type

(*Please turn to page 146*)

FURNACES FOR HEAT TREATING WIRE



ANNEALING WIRE COIL IS A CONTINUOUS OPERATION

The equipment for this installation consists of one SC Gas Fired Bell Type Annealing Cover, two bases, and two steel muffles. While one charge of 6000 lbs. of wire coil is being heated and soaked at 1300° F. under one muffle and the cover, the charge on the base under the second muffle cools, is removed, and the base is reloaded. Thus the annealing operation is continuous.

Fuel consumption is approximately 1500 cubic feet of 1000 BTU gas per hour for the five-hour heating and soaking cycle.

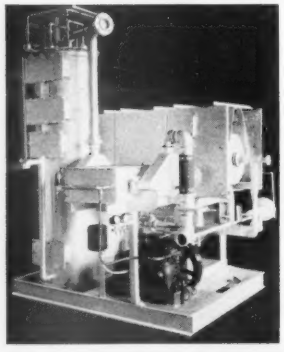
The SC Annealing cover may be used either with a DX Gas Preparation Unit, for bright annealing, or without this unit, when work with a thin, tightly adherent oxide film is desired.

Whether for wire annealing, hardening, patenting or galvanizing, SC furnaces permit increased production, improved surface, better physical properties, dependable uniformity.

Write for information on SC furnaces.

SURFACE COMBUSTION CORP.

Toledo, Ohio.



Above is a standard Surface Combustion DX Gas Preparation Machine. DX Gas can be used in your present heat-treating equipment by simply providing a muffle for the work being treated. It can thus be used for bright annealing, deoxidizing and normalizing, bright hardening and tempering and for many other processes requiring treatment in a controlled atmosphere. Write for information.

Surface Combustion

Toledo, Ohio » *Sales and Engineering Service in Principal Cities*

Builders of HARDENING, DRAWING, NORMALIZING, ANNEALING FURNACES FOR CONTINUOUS OR BATCH OPERATION » » » ATMOSPHERE FURNACES

Wire Association Questions and Answers

(*Continued from page 145*)

for the various treatments are about as follows:

Spheroidizing	1300/1350° F.
Normalizing	1700/1800° F.
Annealing	1200/1300° F.

Q. 11—Is there any special equipment used in cold heading possessing special advantages of any kind?

A.—We have no definite answer to offer to this question.

While we realize that the above answers are more or less of a general nature, we hope the information may be of some useful value.

✦ ✦ ✦

ANSWER NO. 8

1—Hot rolled rods can only be used for cold heading wire when the hardness is low enough to permit the cold work involved in drawing and cold heading. Therefore, whenever the analysis is such that too much hardening occurs in cooling from hot rolling, the rods must be given some kind of treatment either to soften them or change the microstructure to promote cold workability.

2—Analyses used for cold heading involve carbons up to .45%, manganese as high as about 1.10%, normal phosphorus and sulphur as in basic open hearth practice, silicons up to about .30% and various S.A.E. alloys falling in the above ranges of the common elements. Both rimmed and killed steels are used, the former preferably where severe cold heading operations are involved. The common grades are S.A.E. 1010, 1015, X1015, 1020, X1020, 1025, 1030, 1035, 1040, X1040, rarely 1045, 2330, 3115, 3120, 3135, 3140, some 4130 and 5120. On these grades some restrictions may be put on carbon content especially in the lower carbon ranges consistent with low steel cost. Also a common grade is .30/.37% carbon, .60/.90% manganese. Some manganese variations are also encountered.

3—Pickling acid is sulphuric with a concentration of 4 to 6%.

4—Temperature of the pickling bath must be low enough to prevent "burning" of the steel. This will depend on the grade of steel being pickled and will be higher for the lower carbon.

5—Larger rods only need enough time in the bakers to insure drying while the smaller ones apt to be subject to severe work should be baked for at least an hour at temperatures between 350 degrees and 450 degrees.

6—Types of ovens are legion varying from the older coal fired furnaces, oil fired, gas fired and steam heated. The newer furnaces provide for heated air circulation.

7—Finishes are of the soap type and may be used either with or without a sull coat. There is a growing tendency away from the very heavy sull coats.

8—Whenever the size permits, single draft wire is made and of course single blocks are used. Multiple drafting can be done on continuous machines where the product is not to be severely cold-headed or upset.

(*Please turn to page 155*)

Wire Ropes and Stresses

(*Continued from page 131*)

AS will be noted by those familiar with locking wires the design of the units is totally different to those employed in the usual locking formation, and while furnishing a wearing surface equalling that of any other type of locking unit this design allows of approximately 50% wear before risk arises of coming out of lock. Resistance to deformation by crushing is stated to equal that of any solid type of rope, and it is possible to fabricate in two, three, or more layers without detriment to the tubular formation.

✦ ✦ ✦

THOUGH safety factor of a rope is generally expressed as the ratio of its breaking strength to maximum dead load permissible, many un-noticeable stresses arise during service which have a severe detrimental effect on the rope life. Many fractures of wires claimed to be due to defective rope metal are undoubtedly due to lack of precaution to obviate or eliminate by altering working position of rope at frequent intervals, i. e. intervals sufficiently close to prevent excessive wear or damage.

✦ ✦ ✦

INCLINE haulage ropes due to various extra stresses to which particularly subjected are a frequent source of trouble by fracture of the rope metal. Though conditions may be cited as similar to those met in vertical winding, there is additional in that rope and load are drawn up an inclined plane. Difference, adding to stress, is that when hanging in a vertical shaft ropes are clear of obstruction; in incline haulage they encounter additional stress due to being drawn over pulleys, rollers, etc., with often further stress from contact with roof or floor.

✦ ✦ ✦

THESE are all factors imparting additional detrimental stress over and above encountered in vertical winding, and are the cause of many withdrawals after very short service.

(*Please turn to page 148*)

For the pins of roller and conveyor chains, and for many other severe-duty applications, "Konik" supplies a new and valuable combination of properties. Not a stainless steel, yet it resists rust and corrosion far better than ordinary steels. Not a high alloy steel, this patented steel containing copper, chromium and nickel takes a deeper, faster case in any carburizing medium; responds splendidly to heat treatment; resists wear and abrasion. Where unhardened it has rare workability, standing severe cold deformation. "Konik" is cutting costs and improving results for an increasing number of manufacturers. Available in rods and wire.

MANUFACTURERS WIRE

With our exceptional range of sizes, tempers, analyses, shapes, and coatings, plus our special attention to each wire-product problem, we have helped an increasing number of manufacturers to cut costs and improve their products. You are invited to investigate the economies offered by our broad and varied experience. Our metallurgists will gladly serve you. No obligation, of course.

CONTINENTAL STEEL CORPORATION

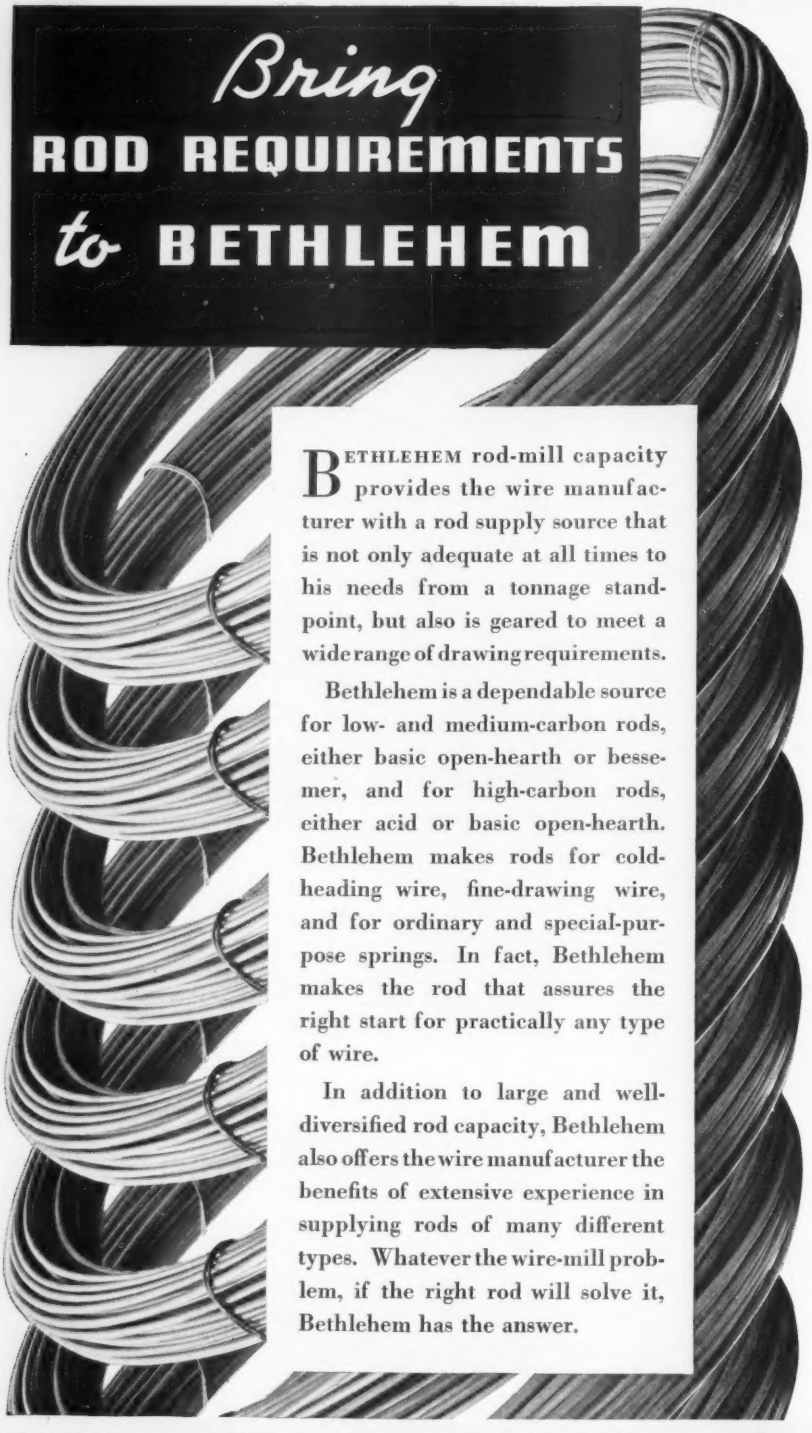
PLANTS AT CANTON, KOKOMO and INDIANAPOLIS

Manufacturers of

Billets and Wire Rods; Bright Basic, Annealed, Galvanized, and "Konik" Wire; Nails, Staples, and Kindred Products.

Lawn, Chain-Link, Diamond Mesh, Farm and Poultry Fence; Barbed Wire, and Bale Ties; Gates, and Posts.

Black, Galvanized, Galvannealed, and Special Coated Sheets; Galvanized and "Seal of Quality" Roofing.



Bring ROD REQUIREMENTS *to* BETHLEHEM

BETHLEHEM rod-mill capacity provides the wire manufacturer with a rod supply source that is not only adequate at all times to his needs from a tonnage standpoint, but also is geared to meet a wide range of drawing requirements.

Bethlehem is a dependable source for low- and medium-carbon rods, either basic open-hearth or bessemer, and for high-carbon rods, either acid or basic open-hearth. Bethlehem makes rods for cold-heading wire, fine-drawing wire, and for ordinary and special-purpose springs. In fact, Bethlehem makes the rod that assures the right start for practically any type of wire.

In addition to large and well-diversified rod capacity, Bethlehem also offers the wire manufacturer the benefits of extensive experience in supplying rods of many different types. Whatever the wire-mill problem, if the right rod will solve it, Bethlehem has the answer.

Bethlehem District Offices are located at Albany, Atlanta, Baltimore, Boston, Bridgeport, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Honolulu, Houston, Indianapolis, Kansas City, Los Angeles, Milwaukee, New York, Philadelphia, Pittsburgh, Portland, Ore., Salt Lake City, San Antonio, San Francisco, St. Louis, St. Paul, Seattle, Syracuse, Washington, Wilkes-Barre, York. *Export Distributor:* Bethlehem Steel Export Corporation, New York.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

GENERAL OFFICES: BETHLEHEM, PA.

Wire Ropes and Stresses

(*Continued from page 147*)

THOUGH basic material finds widest application for wire rope fabrication, acid material is the more economic proposition where "wear" encountered is of what may be termed an "unseen nature", due to crystallization by bending stress and vibration. Acid material is superior for all purposes where reliability is essential, such as winding ropes, lift ropes, etc., and the longer life, greater ductility and higher tensile are factors of importance where consideration has to be given to special conditions in winding or hauling.

✦ ✦ ✦

ELASTICITY is one of the most important features of a wire rope, for the various stresses set up, vibratory; longitudinal and torsional; necessitate efficient cushioning if the rope is to furnish satisfactory service. The rope itself may be compared with a long helicoidal spring, for which a good foundation is essential if strands are to work in unison. This is furnished by the inclusion of a solid-laid fibrous or medium-tempered steel, core.

✦ ✦ ✦

FOR the former hempen cores are often recommended as a good base for the storage of lubricant, but in the opinion of many authorities Manilla cores are superior, for though coarser fibrous nature is a deterrent to conservation of equal amount of lubricant, resistance to detrimental action of moisture and provision of a more solid and elastic foundation, proves them to be the more economic proposition.

✦ ✦ ✦

Salem Engineering Company Changes

MATTHEW H. Mawhinney has retired as a partner from the Salem Engineering Company, but will continue to be associated with the company as consulting engineer.

✦ ✦ ✦

THE business will be continued under the same name by S. F. Kenner.

(*Continued from page 126*)

largely a matter of personal preference. One large manufacturer builds its 10″, 14″ and 16″ sizes either way. The larger machines —20″ and larger—are all mechanically operated because their size introduces certain design requirements which make the application of hydraulically operated mechanisms for traversing the work impractical.

✦ ✦ ✦

ONE of the important features of a hydraulically operated grinder is that infinite table speeds between the high and low limits are available. The most important feature is that machines in which the table is propelled by a piston and cylinder afford an unusually smooth action. The design is such that the piston rod is always in tension and the rate of table traverse is regulated by throttling the discharge of oil under pressure. Other types employ a hydraulic motor for driving the table but transmit the drive through a rack and pinion a design which it would seem largely defeats or nullifies the principal advantage—namely smoothness of table action—because gear teeth still must mesh with the rack in order to drive the table. With the larger machines, this characteristic becomes less important because of the much heavier table and work ground. Vibration from this source is absorbed by the greater mass, therefore, rendering it impotent.

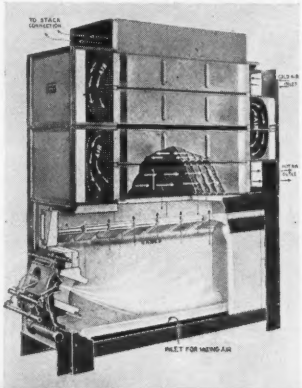
✦ ✦ ✦

THE table and wheel head ways of practically all grinding machines today are pressure lubricated, a feature which causes these units literally to float on film of oil. In addition, the areas of the ways are such that the unit pressure is well under 10 pounds. This pressure, of course, in the case of table ways will depend on the weight of the roll being ground. Those contemplating the purchase of a roll grinding machine would do well to investigate this point. Not only does it assure minimum wear but

(*Please turn to page 150*)

ROSS AIR HEATERS

for economical wire baking



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●Not all corrosion, but much of it, can be prevented by using materials of construction that are resistant to the acid.

●Everything we make is for the purpose of handling corrosive liquids. For instance: one strip mill is using Duriron pumps for pumping pickle liquor from the pickler to neutralizing tanks. Another mill uses Duriron steam jets to heat, circulate and agitate the liquor. A wire mill is using Duriron for saddles and bars in their cleaning vat.

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Have you received the data on this NEW Oakite coating material?

A NEW and better coating material is now available that will be of real interest to wire mill superintendents everywhere. One of its several advantages when used on low carbon wire is that it dries in a few minutes so that a baking operation is unnecessary. Saves time in handling . . . helps speed production.

This new development in a coating material . . . Oakite Composition No. 42B . . . is already in successful use. It is a result of our many years' experience in wire mills. Without obligation on your part let us send you further information on its use.

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COMPOSITION NO. 42 B

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7. **LOWEST PRICES,** commensurate with Quality combined with the largest manufacturing capacity.

VIANNEY WIRE DIE WORKS • 250 EAST 43rd STREET • NEW YORK

Roll Grinding

(*Continued from page 149*)

considered with the overall width of both ways gives an indication of the stability of these units. For if one imagines the table ways, for example, being knife edges, it immediately becames apparent that vibration aplenty can be expected. And it is vibration which causes many of the headaches in roll grinding.

✦ ✦ ✦

IDLERS are another source of vibration but the better known machines have eliminated these by the use of direct, multiple vee belt drives. The wheel drive motor is mounted at the rear of the wheel unit and drives the wheel spindle without the use of idlers at all. Not only does the motor compensate for the heavier portion at the front of the wheel unit due to the wheel spindle, grinding wheel and wheel guard, thus distributing the weight more uniformly, but simplifies the drive by reducing the number of revolving elements to a minimum.

✦ ✦ ✦

Requirements to Produce a Satisfactory Finish

A GRINDING wheel must be in balance to produce a satisfactory finish but this is especially true in roll grinding. Most manufacturers of grinding machines construct the wheel sleeve (that unit which holds the wheel on the spindle) with adjustable balance weights. With the grinding wheel mounted on the sleeve, the whole assembly is then placed on a balancing stand and checked for static balance before mounting it on the machine. By adjusting the balancing weights, the wheel assembly can be balanced as a unit. This subject of wheel balance is very important and every shop using a grinding machine should have balancing equipment on hand. Grinding wheels are balanced by the manufacturer but after a wheel becomes somewhat worn, its balance may change. Sometimes if a grinding wheel has been allowed to stand over night with part of its periphery submerged in coolant, it

will absorb sufficient coolant to throw the wheel out of balance when started. Running the wheel for a while drives the water from it.

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THERE are many other details of grinding machine construction to be considered but which for lack of space cannot be discussed at length in this article. The size and type of headstock, how it is driven, its weight, the area of its bearing on the table and the size of the center are all essential considerations. Even such seemingly unimportant questions as the manner of clamping the headstock and footstock to the table will affect the results one can obtain, for remember, you are working with infinitesimal measurements and distorting the work centers a minute amount may mean the difference between success and failure.

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NO article on roll grinding machines, however, would be complete without a consideration of the wheel spindle and its bearings. Each grinding machine builder has developed some particular type which in his opinion is best. All no doubt have merit but in the writer's judgment, a type which gives the most support to the spindle will produce the best results. One type is particularly worthy of mention.

✦ ✦ ✦

THE spindle is made of heat treated alloy steel and runs in hard bronze bearings. These bearings are tapered on their outer diameters and ground. They are held in cast iron cases which are hand scraped to receive them, the cases being ground externally and pressed into the bearing housings of the wheel unit. At regular intervals around the outside of the bronze bearings are narrow slots milled part way through and running the entire length of the bearing. Through the side, away from the normal pressure in the bearing, a larger slot is milled which receives a wedge bolt that is tightened from the outside. A spanner nut at each end of the bearing is provided and adjustments are made by loosening the wedge bolts

(*Please turn to page 152*)

Bell-Mine Products — American Lime & Stone Company — Marble Company — Management

NO GRIT

Bell-Mine Pulverized Lime

slaked for use in wire drawing, yields a large volume of fine putty free from grit.

This lime is burned from pure stone that is mined 700 feet under ground. There is constant, skilled chemical supervision of its production. It is shipped in tight steel drums or in strong multi-walled paper bags.

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FOR CARBON STEELS ▲ ▲ ▲

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The strong passivating effect of this excellent inhibitor insures a bright finish and forms a sound basis for a bright drawing technique—

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NORBIDE is the registered trade mark for Norton Boron Carbide (B,C)

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AUTOMATIC SPARK TESTING EQUIPMENT
FOR
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For Further Details Address

R. L. Davis Electric Co.

340 CENTER ST. WALLINGFORD, CONN.

Roll Grinding

(*Continued from page 151*)

and drawing the bearing into its case by means of one of the spanner nuts. The bearings themselves are hand scraped to a master spindle, somewhat larger by a few thousandths than the grinding wheel spindle, to provide the initial oil clearance. This type of construction provides support for over 80% of the spindle bearing circumference in a bronze bearing which is closely fitted to a case rigidly held in the bearing housing. Adjustments are easily made without rescraping or removing shims, and the bearings are floor lubricated, the oil passing through a filter just before it enters each bearing.

✦ ✦ ✦

Exports and Imports

(*Continued from page 135*)

Germany was the next supplier of importance (9,928 tons), and predominating items in its trade being barbed wire (1,968), nails, tacks, and staples (1,684), pig iron (1,450), 'other pipe' (1,162) and sheet piling (978). Prominent in receipts from Belgium (9,043 tons) were structural shapes (3,502), bars, whether solid or hollow (1,724), 'other hoops and bands' (1,561), and sheets, skelp, and sawplate (874). Receipts from the Netherlands (7,031 tons)—next in importance—were practically all made up of pig iron (7,025). British India confined its entire participation to pig iron (4,704 tons).

✦ ✦ ✦

CARD **clothing** imports (16,026 square feet valued at $22,229) were somewhat below the level of the earlier month (12,773 square feet valued at $16,633) and were sent in by the United Kingdom (11,415 square feet valued at $15,023), Germany (4,539 square feet valued at $6,841), and Switzerland (72 square feet valued at $365).

✦ ✦ ✦

RECEIPTS of **wire cloth and screening** (103,820 square feet) continued their upward movement, increasing 21.2 percent over the November trade. This aggregate came chiefly from Germany

(73,189 square feet), the Netherlands (18,436 square feet), Canada (8,073 square feet), and Japan (2,485 square feet).

✦ ✦ ✦

THE trade in **fourdrinier and other paper-making wires** (38,591 square feet) approximated the November total and came mostly from Germany (22,156 square feet), Austria (9,074 square feet), and France (5,688 square feet).

✦ ✦ ✦

IMPORTS of **wire heddles** (1,895,000 pieces) veered upward very sharply (1,715,000 pieces), and were received from France (1,546,000 pieces), and Germany (349 pieces).

✦ ✦ ✦

WIRE **fencing and netting** (galvanized before weaving) receipts totaled 171,500 square feet and recorded a decline of 33 percent. The suppliers were Belgium (90,000 square feet), and the Netherlands (81,500 square feet). Of the galvanized after weaving trade, receipts amounted to 4,411,175 square meet to register a substantial increase (3,025,716 square feet) over the November total. Belgium (2,197,700 square feet), Germany (1,155,000 square feet, and the Netherlands (1,057,475 square feet) covered this trade.

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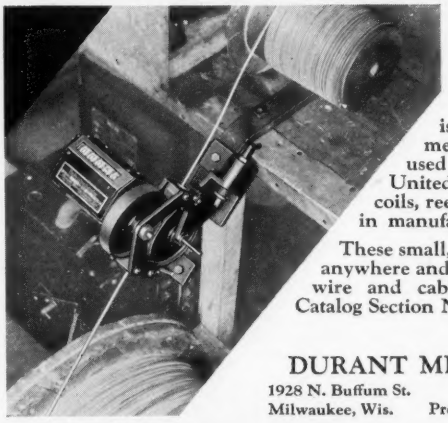
EXPORTS of iron and steel wood screws during December, 1935 totaled 53,780 gross valued at $7,653. Of this total the Union of South Africa took 22,202 gross valued at $2,339; Japan 10,894 gross valued at $1,121; United Kingdom 9,108 gross valued at $2,250; Cuba 2,534 gross valued at $317; Australia 970 gross valued at $183; Philippine Islands 945 gross valued at $336; Brazil 900 gross valued at $200; Mexico 838 gross valued at $104; Panama 836 gross valued at $106.

✦ ✦ ✦

EXPORTS of brass wood screws during the same period amounted to 3,608 gross valued at $1,736. Of this total Brazil took 630 gross valued at $650; Panama 630 gross valued at $239; Cuba 551 gross valued at $139; Philippine Islands 410 gross valued at $85; Canada 338 gross valued at $173; Venezuela 337 gross valued at $104.

(*Please turn to page 157*)



THE ONLY WAY TO MEASURE WIRE ACCURATELY

is to run it through a dependable wire measuring machine. *Productimeters* are used in most of the wire plants of the United States for getting accurate footage on coils, reels, and spools, measuring off wire, and in manufacturing wire products.

These small, compact machines can be mounted anywhere and are adapted to bare or insulated wire and cable .005 to .5 in. Send for Catalog Section No. 3.

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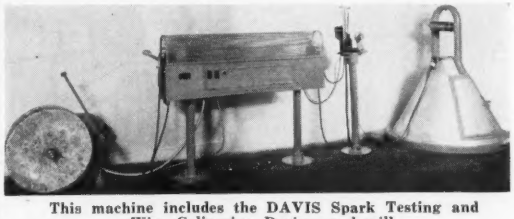
Productimeters
THE SPEEDOMETERS OF INDUSTRY



This machine includes the DAVIS Spark Testing and Wire Calipering Devices and will
1—Depan rubber covered wire after vulcanization,
2—Stop automatically if wire tangles when leaving pan,
3—Measure total length of wire and, if desired, stop on reaching any predetermined length as measured by an auxiliary dial,
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5—Spark test rubber insulation for faults,
6—Wind the wire on a reel on a motor driven reel stand.

Automatic depanning, wire measuring, spark testing and reeling outfit—combines many operations — saves time and labor cost.

(Patent applied for)

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Paralan will give your finished wire and wire products protection from atmospheric corrosion in the mill and in shipping. Paralan-coated wire can be spot welded or soldered without cleaning. Also, Paralan leaves surfaces in good condition for all types of finishes—enameling, japanning, lacquering, plating, etc.

Write for further information. We may be able to solve your difficulties.

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DESIGNERS AND MANUFACTURERS
OF EQUIPMENT FOR
THE WIRE MILLS AND SPRING MAKERS

THE MACHINES THAT PUT THE 'RINGS' IN 'SPRINGS'

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FLEXIBLE CASING AND
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(for wet drawing)

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Outstanding Personalities of the Wire Industry

(*Continued from page 141*)

Fort Wayne Electric Works, and in 1909 became manager of the Northern Electrical Manufacturing Company plant in Madison, Wisconsin. This company was absorbed by the Fort Wayne company, which in turn became the Fort Wayne works of General Electric. In 1916 he became assistant to the manager of the Fort Wayne works, in 1918 assistant manager, and in 1922, manager.

✦ ✦ ✦

BORN in Germany, Mr. Good attended the Royal Technical School at Stuttgart, coming to the United States after his graduation in 1911. For two years he was employed by three different companies in Cincinnati and in 1913 entered the employ of General Electric in the general superintendent's office in Schenectady, in connection with milling machines. Two years later he was assigned to efficiency work in the heavy apparatus department and in 1919 was named to make an analysis of manufacturing methods. In 1920 Mr. Good returned to the office of the general superintendent, three years later became assistant to the superintendent of the induction motor department, and in 1928 was selected as superintendent of the milling department, the post he held when appointed assistant manager at Philadelphia in 1929.

PROCEEDINGS AND
DISCUSSIONS
of the 1935
WIRE ASSOCIATION
MEETINGS

Price $5.00 Per Copy

Inhibitors

(*Continued from page 129*)

ity than the other, it has a better inhibitor, by exactly the percentage of the difference in acidity. If one is 4.5% acidity and the other 5%, and one inhibitor is 10% better than the other. High acid is of course the winner. The iron test should check the acidity exactly but in reverse. Low iron is the winner. If the acid figure with the current inhibitor is known to be 40 lbs., and the new inhibitor shows 10% better, its figure may be safely set at 36 lbs.

✦ ✦ ✦

THIS test bars out, to a very great extent, the variables and hazards of mill testing. It is always possible of course, though highly improbable, that one end of a 5″ piece of rod will clean harder than the other, but any such accident would be cancelled out during a day's run in the beakers. The accuracy of the test is limited only by the fairness of the tester. The only hitch seems to be that the heating is not done with a steam jet, and it is possible that live steam breaks down some of the organic inhibitors. This seems a small matter.

✦ ✦ ✦

Abnormal Action on Sorbite

DURING tests of this sort I recently ran onto the fact, unsuspected by me but perhaps known to others, that the various mettallographic constituents of steel react differently to different inhibitors. Inhibitor A showed up much superior to inhibitor B on basic rod, but on patented rod B showed a slight but distinct advantage over A. This persisted on recheck. On a rather hasty survey it appeared that there is a distinction between a steel with large ferrite masses, and a steel with a fine pearlite or with the structure we have known so long as sorbite. Low carbon basic rod and spheroidized steel fall into one class, patented rod, high carbon strip as rolled, and medium carbon rod as rolled fall into the other.

✦ ✦ ✦

INCIDENTALLY, a mixture of inhibitors A and B, intended as a compromise, was very lousy.

Wire Association Questions and Answers

(*Continued from page 146*)

9—There are several producers of soap who are marketing suitable drawing compounds for this art.

10—Normalizing consists of heating above the critical range high enough to obtain the desired grain size followed by cooling in still air. It is not adaptable to the higher carbon alloys because of possible hardening. When these are treated they are usually spheroidized. Annealing may be a process anneal below the critical range in the neighborhood of 1250 degrees with a comparatively long soak or it may be heated above the critical temperature followed by a slow cool. The treatment depends on the grade and use intended. Spheroidizing usually consists of heating above the Ac, followed by slow cooling. It is also obtained by a long soak below the critical temperature. This critical temperature will vary with the grade of steel used.

11—As far as special equipment for cold heading is concerned, this question can better be answered by the cold heading people.

Make Your Plans Now
To Attend The
Wire Association Meetings
At Cleveland, Oct. 19-23

Improved Trolley Wheel For Tramrail Systems

AN important development in Osborn Tramrail Systems is a trolley wheel of improved design. The new wheel is a special analysis, high strength, iron casting with deep-chilled tread and flange. This provides a hard, smooth, long-wearing tread surface. Slight crown of the wheel tread brings the wear on the rail flange in from the outside. The straight flange of the wheel is a factor in reducing rolling friction to a minimum.

✦ ✦ ✦

ANOTHER important factor is the double row shielded type ball bearing which is assembled complete by the bearing manufacturer to assure extreme accuracy of the bearing in the wheel. The dust-protected bearing is grease lubricated and the assembly may be taken apart for inspection and cleaning. A trolley equipped with these wheels is claimed to have an exceptionally low draw bar pull.

Premier
TRADE MARK REG. U.S. PAT. OFF.
Diamond Dies
Reduce Rejects
Give Better Finish
Hold To Size Longer
Cast Straight On
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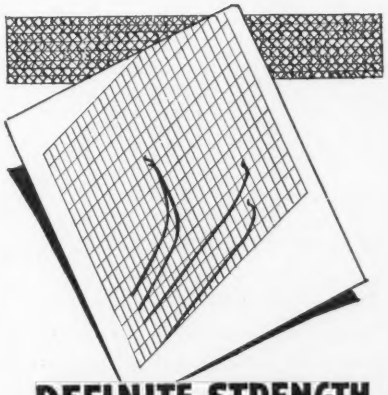

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For Reduction of Music Wire, Stainless and Alloys.
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New Booklets Issued by Bethlehem Steel Company Fence Posts

ILLUSTRATIVE folder No. 227c, describes, in general, the Studded Omega "U" Fence Posts, and shows the proper method of securing woven wire fence to the posts so that it will remain neat and stand erect as long as the wire lasts. Copies of this illustrated folder may be had upon request.

✦ ✦ ✦

Bethanized Wire

ILLUSTRATED folder No. 294-A, covers information on the minimum weight of coating per square foot of bare wire; Bethanizing classification, and extra applying to manufacturers Basic and Bessmer Drawn Wire; extras per 100 lb. for Bethanized Fence Fabric and Barbed Wire; and includes a few of the successful applications of Bethanized Wire. Copies of this folder may be had upon request.

✦ ✦ ✦

Lindberg Furnace

BULLETIN No. 51 recently issued by the Lindberg Engineering Co., Chicago, Illinois, is descriptive of the gas fired Lindberg Cyclone furnace. This bulletin describes the construction of the furnace, the Cyclone principle of recirculation and the results which should be obtained from the use of these furnaces.

Copies of this bulletin can be obtained by addressing the Editor.

Make your plans now to attend the Wire Association meetings, Cleveland, O., Oct. 19-23, 1936

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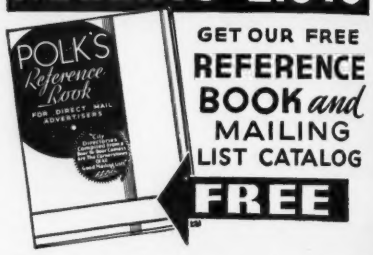

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✦ ✦ ✦

NOT only does it contain detailed specifications and references to governing standards, notably those of the American Society for Testing Materials, but it is compiled and arranged for quick, convenient reference, starting with "Asphalt" apparatus and proceeding by subject to "Viscosity." Of noteworthy importance is the A. S. T. M. reference index included, indicating at a glance the apparatus necessary for each A. S. T. M. Designation.

✦ ✦ ✦

IN addition to apparatus used specifically for testing petroleum products and bituminous materials, the catalog contains information on general utility apparatus, such as Burners, Electric Heaters and Hot Plates, Stirrers, Constant Temperature Baths, etc. For laboratories running a large volume of identical tests, many multiple set-ups of apparatus are shown.

✦ ✦ ✦

Hayes Electric Furnace

A NEW bulletin has just been issued describing the Hayes electric furnace for bright annealing. This bulletin shows the class of furnace, the types of work for which they are adapted, the atmospheres and cooling and quenching mechanisms together with sizes of heating chambers, etc.

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✦ ✦ ✦

Exports and Imports

(*Continued from page 153*)

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ABRASIVES—
Norton Co., Worcester, Mass.

ANNEALING POTS AND BOXES
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.

ANODES—Nickel
Seymour Mfg. Co., Seymour, Conn.

ARMORING EQUIPMENT
Amer. Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Seymour Mfg. Co., Seymour, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

BAKERS—Rod and Wire
Lindberg Engineering Co., Chicago, Ill.
Morgan Construction Co., Worcester, Mass.
Morrison Engineering Co., Cleveland, O.
Ross Engineering Corp., New York, N. Y.

BORON CARBIDE—
Norton Co., Worcester, Mass.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
American Machine & Foundry Co., Amaloy Div., Brooklyn, N. Y.
Delany Chemical Co., Tacony Station, Philadelphia, Pa.
Houghton & Co., E. F., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin Co., The Wm., Pittsburg, Pa.

CLEANING & PICKLING EQUIPMENT
Broden Construction Co., Cleveland, O.
Duriron Co., The, Dayton, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

COATING—Protective
American Lanolin Corp., Lawrence, Mass.
Houghton & Co., E. F., Philadelphia, Pa.

COILERS—Sheet, Strip and Wire
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Ansonia, Conn.
H. J. Ruesch Machine Co., Newark, N. J.

COMPOUNDS—Cleaning
Houghton & Co., E. F., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.

CONDUITS—Iron and Steel
Youngstown Sheet & Tube Co., Youngstown, Ohio.

CRANES—Wire Mill
Cleveland Electric Tramrail Div., of Cleveland Crane & Eng. Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

DIES—Diamond
Balloffet Diamond Wire Dies Co., Inc., N. Y. C.
Cochaud Wire Die Co., New York.
Driver Harris Co., Harrison, N. J.
Kelly Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York.

DIES—Lead Extrusion
John Robertson Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Cochaud Wire Die Corp., New York.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y
Union Wire Die Corp., New York, N. Y.
Vianney Wire Die Wks., N. Y.

DIES—Rod and Tube Drawing
Bissett Steel Co., Div. of Tungsten Electric Co., Cleveland, O.
Carboloy Co., Inc., Newark, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Master Wire Die Co., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vianney Wire Die Works, New York, N. Y.

DIES—Tantalum Carbide
Bissett Steel Co., Div. of Tungsten Electric Co., Cleveland, O.
Kelly Wire Die Corp., New York, N. Y.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vianney Wire Die Works, New York, N. Y.

DIES—Tungsten Carbide
Bissett Steel Co., Div. of Tungsten Electric Corp., Cleveland, O.
Carboloy Co., Inc., Newark, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Master Wire Die Co., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Vanadium Alloys Steel Co., Pittsburgh, Pa.
Vianney Wire Die Works, New York, N. Y.

DRAW BENCHES
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.

ENGINEERS—Consulting Galvanizing
W. H. Spowers, Jr., New York, N. Y.

ENGINEER—Consulting Wire Mill
Lewis, Kenneth B., New York, N. Y.

BUYERS' GUIDE, Continued

ENGINEERS—CONSULTING—Non-ferrous Wire Mill
New Products Development Corp., Yonkers, N. Y.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FILLERS—Paper for Cable
E. W. Twitchell, Inc., Phila., Pa.

FURNACES—Annealing
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
Ross Engineering Corp., New York, N. Y.
Surface Combustion Co., Toledo, O.

FURNACES—Automatic
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
Surface Combustion Co., Toledo, O.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
Ross Engineering Corp., New York, N. Y.
Surface Combustion Co., Toledo, O.

FURNACES—Electric
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.

FURNACES—Hardening and Tempering
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
Surface Combustion Co., Toledo, O.

FURNACES—Lead Melting
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
John Robertson Co., Brooklyn, N. Y.
Surface Combustion Co., Toledo, O.

FURNACES—Non-Oxidizing
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
Surface Combustion Co., Toledo, O.

FURNACES—Wire, Strip and Sheet
Electric Furnace Co., Salem, O.
Lindberg Engineering Co., Chicago, Ill.
Ross Engineering Corp., New York, N. Y.
Surface Combustion Co., Toledo, O.

GEARS—Wire Mill
Farrel-Birmingham Co., Ansonia, Conn.

GRINDERS—Roll
Farrel-Birmingham Co., Ansonia, Conn.
Norton Co., Worcester, Mass.

HANDLING EQUIPMENT—Material
Cleveland Electric Tramrail, Div. of Cleveland Crane & Eng. Co., Wickliffe, O.

INHIBITORS
American Chemical Paint Co., Ambler, Pa.
Delany Chemical Co., Tacony Station, Philadelphia, Pa.
Houghton & Co., E. F., Philadelphia, Pa.
Parkin Co., The Wm., Pittsburgh, Pa.

INSULATION—Cable or Cable Filler
E. W. Twitchell, Inc., Phila., Pa.

LATHES—Die Reaming
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

LIME—Pulverized
Amer. Lime & Stone Co., Bellefonte, Pa.

LININGS—For Acid Tanks
American Hard Rubber Co., New York, N. Y.

LUBRICANTS—Wire Drawing
American Machine & Foundry Co., Amaloy Div., Brooklyn, N. Y.
Gore, T., Brooklyn, N. Y.
Houghton & Co., E. F., Philadelphia, Pa.
R. H. Miller Co., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
J. T. Robertson & Co., Syracuse, N. Y.

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Sleeper & Hartley, Inc., Worcester, Mass.
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Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
New England Butt Co., Providence, R. I.
Saylor, F. D. & Son, Detroit, Mich.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Bunching
Amer. Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Machinery Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Company, Paterson, N. J.

MACHINERY—Chain Making
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Coilers
Broden Const. Co., Cleveland, O.
Farrel-Birmingham Co., Ansonia, Conn.
Morgan Const. Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Copper Wire Drawing and Rolling
Farrel-Birmingham Co., Ansonia, Conn.
H. J. Ruesch Machine Co., Newark, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Covering Wire—
Saylor, F. D. & Son, Detroit, Mich.
Syncro Machine Co., Newark, N. J.

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Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Ansonia, Conn.
Hallden Machine Co., Thomaston, Conn.
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Sleeper & Hartley, Worcester, Mass.

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MACHINERY—Extruding
John Robertson Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Forming
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

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H. J. Ruesch Machine Co., Newark, N. J.
Watson Machine Co., Paterson, N. J.

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Norton Co., Worcester, Mass.

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MACHINERY—Lead Stripping
John Robertson Co., Brooklyn, N. Y.
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MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Material Handling
Cleveland Electric Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MACHINERY—Measuring Wire & Cable
Davis Electric Corp., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis., and Providence, R. I.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

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Glader Mfg. Co., Chicago, Ill.
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MACHINERY—Pointing
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H. J. Ruesch Machine Co., Newark, N. J.
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Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rod Mill
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Farrel-Birmingham Co., Ansonia, Conn.
Morgan Const. Co., Worcester, Mass.
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W. A. Schuyler, New York, N. Y.

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Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

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New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

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New England Butt Co., Providence, R. I.
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Watson Machine Co., Paterson, N. J.

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Watson Machine Co., Paterson, N. J.

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Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
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Hallden Machine Co., Thomaston, Conn.
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W. A. Schuyler, New York, N. Y.
F. B. Shuster, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Const. Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Swaging
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Worcester, Mass.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Taping
Amer. Insulating Mach. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

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MACHINERY—Testing Size of Wire
R. L. Davis Elec. Co., Wallingford, Conn.

MACHINERY—Testing Wire
Henry L. Scott Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
Amer. Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Turks Head, For Rolling Special Shaped Wire
Standard Machinery Co., Auburn, R. I.

MACHINERY—Welding Wire
Micro Products Co., Chicago, Ill.
F. B. Shuster Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
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Broden Const. Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
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Thomson-Judd Wire Machinery Co., Lynn, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Company, Paterson, N. J.

MACHINERY—Wire Tinning
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Wrapping Wire
W. A. Schuyler, New York, N. Y.

MATERIAL HANDLING EQUIPMENT—
Cleveland Electric Tramrail Div., of Cleveland Crane & Eng. Co., Cleveland, O.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.

OVENS—Annealing or Drying
Lindberg Engineering Co., Chicago, Ill.
Ross Engineering Corp., New York, N. Y.

PAPER—Insulating
E. W. Twitchell, Inc., Phila., Pa.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Delany Chemical Co., Tacony Station, Philadelphia, Pa.
Houghton & Co., E. F., Philadelphia, Pa.
Parkin Co., The Wm., Pittsburgh, Pa.

PICKLING—Tank Linings
American Hard Rubber Co., New York, N. Y.

POTS—Annealing, Case Hardening and Tempering
Lindberg Engineering Co., Chicago, Ill.

POTS—Lead Melting
Farrel-Birmingham Co., Ansonia, Conn.
John Robertson Co., Brooklyn, N. Y.

PRESSES—Hydraulic and Mechanical
Farrel-Birmingham Co., Ansonia, Conn.
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead
John Robertson Co., Brooklyn, N. Y.

PULLERS—Wire
E. J. Scudder Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
John Robertson Co., Brooklyn, N. Y.

REEL AND TENSION STAND—
Sleeper & Hartley, Inc., Worcester, Mass.

REEL CRUTCHES
Watson Machine Co., Paterson, N. J.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS—
Morrison Engineering Co., Cleveland, O.

RODS—Wire—Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Laclede Steel Co., St. Louis, Mo.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

ROLLS—
Farrel-Birmingham Co., Ansonia, Conn.

RUST PROOF COMPOUND
American Lanolin Co., Lawrence, Mass.
Houghton & Co., E. F., Philadelphia, Pa.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Republic Steel Co., Youngstown, O.
Superior Sheet Steel Co., Canton, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SOAPS—Wire Drawing
Gore, T., Brooklyn, N. Y.
Houghton & Co., E. F., Philadelphia, Pa.
R. H. Miller Co., Homer, N. Y.
J. T. Robertson & Co., Syracuse, N. Y.

STRIP—Brass, Zinc and Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Laclede Steel Co., St. Louis, Mo.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TESTERS—Wire
Henry L. Scott Co., Providence, R. I.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS
H. J. Ruesch Machine Co., Newark, N. J.

TURKS HEADS—
Standard Machinery Co., Auburn, R. I.

VALVES AND FITTINGS—Acid Proof
Duriron Co., The, Dayton, O.

VULCANIZERS
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS
American Insulating Mach'y Co., Phila., Pa.

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Laclede Steel Co., St. Louis, Mo.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Corp., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.

WIRE—Enameled For Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Co., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Laclede Steel Co., St. Louis, Mo.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, Ohio

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Company, Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.

WIRE—Non Ferrous to Specification For Special Purposes
Hudson Wire Co., Ossining, N. Y.
Seymour Mfg. Co., Seymour, Conn.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel and Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Seymour Mfg. Co., Seymour, Conn.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Laclede Steel Co., St. Louis, Mo.
Pittsburgh Steel Co., Pittsburgh, Pa.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE AND STRIP—Brass, Zinc
Platt Bros. & Co., The, Waterbury, Conn.

This is a carefully classified index of concerns who specialize in this industry and who advertise regularly in WIRE & WIRE PRODUCTS. Please mention WIRE when writing to these firms.

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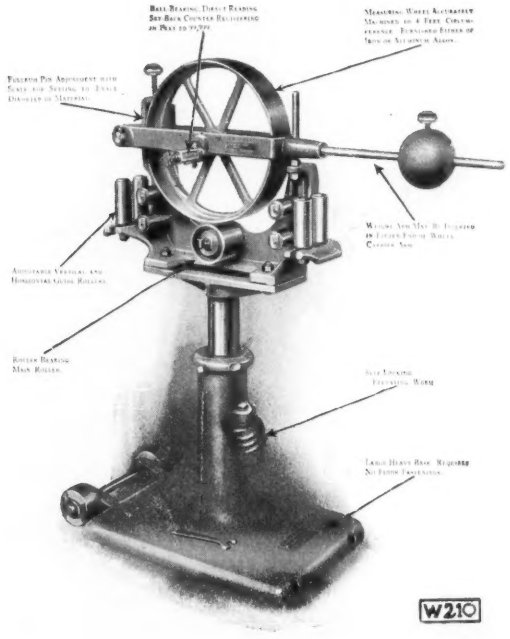

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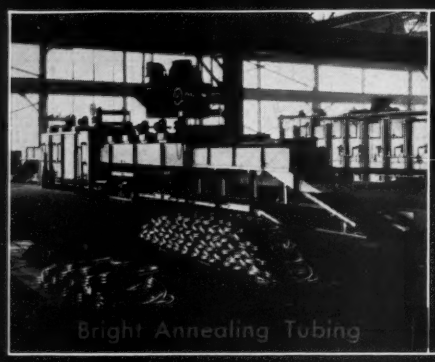
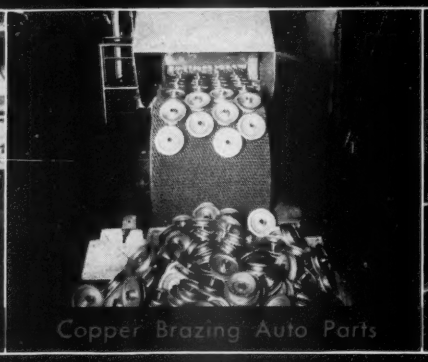
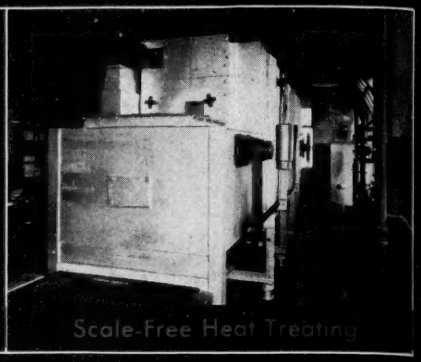


Bright Annealing Tubing



Copper Brazing Auto Parts



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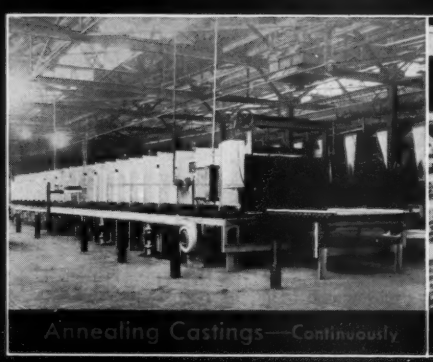
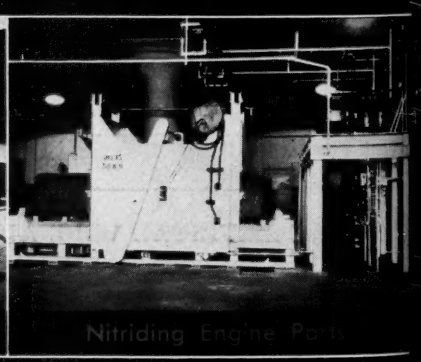
THE ELECTRIC FURNACE CO., SALEM, OHIO



Annealing Castings—Continuously

Bright Annealing Steel Wire



Nitriding Engine Parts